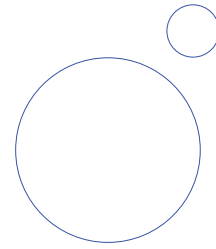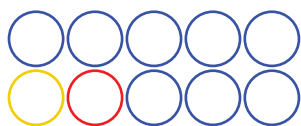# Count Me In Too

THE LEARNING FRAMEWORK IN NUMBER AND ITS
IMPACT ON TEACHER KNOWLEDGE AND PEDAGOGY

A report prepared on behalf of
the NSW Department of Education & Training for the
Count Me In Too program 2008
by
Associate Professor Janette Bobis
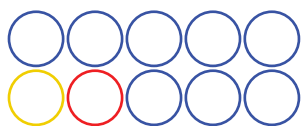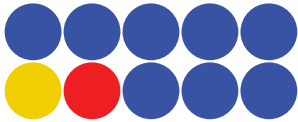University of Sydney

February 2009

count Me In Too

2009 Report

NEALS

count Me In Too

2009 Report

Contents

NEALS

EXECUTIVE SUMMARY

AIM OF THIS STUDY

This study is concerned with teacher professional learning and the impact of this learning on teaching practices. Its focus is on teacher knowledge of the *Learning Framework In Number* [LFIN] from the *Count Me In Too* [CMIT] numeracy project operating in Department of Education & Training (DET) schools across New South Wales (NSWDET, 2007).

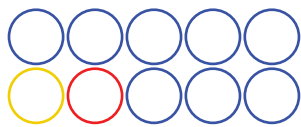In particular, the study addresses the following research questions:

1. What are teachers' perceptions about the degree to which CMIT is being implemented at the school and classroom levels?

2. What are teachers' perceptions about the extent of their knowledge of the *Learning Framework In Number*?

3. Do teachers perceive that the *Learning Framework In Number* has impacted on teaching practices at the school, classroom and student levels? If so, how? If not, why?

4. How confident do teachers feel about identifying children's levels of mathematical development on the LFIN?

5. To what extent is the CMIT planning matrix a useful tool for identifying the level of reported implementation of the program at the school and classroom levels?

RESEARCH DESIGN

Three primary schools were purposively selected by NSW Department of Education and Training authorities and then invited to participate in the study. Criteria for selection were based on a school's action plan detailing 2008 outcomes and processes for the implementation of CMIT in their school and their willingness to participate in the evaluation. A case study of each school was compiled that specifically focused on teacher knowledge of the *Learning Framework In Number* and its impact on their pedagogy.

Information was gathered from three main sources:

1. Survey;

2. Semi-structured interviews with staff from each of the schools; and

3. Documents (such as school management plans and teacher programs).
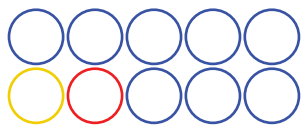
NEALS

SUMMARY OF RESULTS AND RECOMMENDATIONS

This section summarises the main findings in terms of the research questions and makes recommendations for the CMIT program.

1. WHAT ARE TEACHERS' PERCEPTIONS ABOUT THE DEGREE TO WHICH CMIT IS BEING IMPLEMENTED AT THE SCHOOL AND CLASSROOM LEVELS?

Information concerning teachers' perceptions about the degree to which CMIT is implemented at their schools and in their classrooms was gathered initially via the survey and then supplemented by interview data. The CMIT planning matrix (Appendix B) was used in the survey to allow teachers to self-rate themselves and their school according to the group of descriptors they felt best described the way CMIT operated on four aspects—Whole School Management, Teaching Practice, Assessment Practices and the Parent and Community Focus. Survey responses from all three schools consistently indicated that within each school, there was minimal involvement of parents with limited information about how the program operates being disseminated to the community. This aspect of the program was not targeted for follow-up at the interview stage of the current study so reasons for this perception cannot be elaborated upon. However, it is a potential area for study in future evaluations of the program.

Survey respondents particularly from Schools A and C generally perceived that CMIT was operating at the Whole School Management level, Teaching Practice and the Assessment Practice aspects at a level consistent with Group 2 or 3 Descriptors from the matrix. From the interview data, it was found that variation in this perception occurred across grade and stage levels—with Kindergarten and Year 1 teachers the most convinced that CMIT was operating in quite a robust manner in their classrooms and the classrooms of teachers from the same stage. This more positive perception is possibly due to the fact that in most cases, CMIT had been operating slightly longer in the infant classes than in the higher grades, therefore it was more established in terms of consistency in programming and the development of resources. Variation in perceptions was also related to the amount of experience an individual teacher or Stage team had implementing the program. In the case of School A, where teachers undertook CMIT training in Stage teams (subsequently redesigning aspects of their programming and the way they structured their classrooms for instruction collaboratively) there was a more consistent view as to the degree to which CMIT was operating. Additionally, the practice at School A of conducting classroom visits between the different grades increased individual teachers' awareness of other teachers' pedagogy in mathematics.

Overall, a more robust implementation of CMIT and an explicit use of the LFIN were more evident at School B than for either of

the other schools. For example, more than half of School B survey respondents considered Assessment to be best described by Group 1 or 2 Descriptors on the CMIT planning matrix. This means that the majority of respondents perceived there to be an understanding by teachers at their school of the LFIN and that flexible use of the SENA guided their assessment of students and informed their instructional practices. Consistent with survey findings, interviews confirmed that whole school professional development focusing explicitly on the LFIN occurred at School B and that there was an emphasis on integrating the Framework into teaching programs.
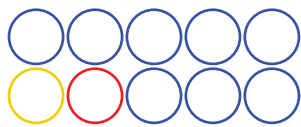
RECOMMENDATION 1.1

Count Me In Too Facilitators should focus on developing a deeper and shared understanding of the *Learning Framework In Number* among all staff through whole school professional development.

RECOMMENDATION 1.2

To enhance consistency in programming, that also includes a focus on the Framework to guide instruction, school administrators should encourage collaborate programming at the Stage level.

2. WHAT ARE TEACHERS' PERCEPTIONS ABOUT THE EXTENT OF THEIR KNOWLEDGE OF THE *LEARNING FRAMEWORK IN NUMBER*?

Information about the extent to which teachers considered they understood the LFIN and the extent to which they considered it to have increased their awareness of children's development in number was gathered by the survey and during the interview. In both instances, teachers were asked to self-rate their perceptions on a scale from 0 to 4 (nil to excellent). Data from both the survey and the interviews revealed that the majority of teachers from each school agreed that knowledge of the LFIN had significantly increased their awareness of children's mathematical develop in number—with 17 out of 28 (60.7%) survey respondents and 17 out of a total 22 (77.2%) interviewees rating the extent of its impact at the top two levels. However, both survey respondents and interviewees were reluctant to rate their understanding at the highest (excellent) level, despite evidence obtained during the interviews indicating that a total of eight teachers could comprehensively interpret student strategy development and clearly articulate appropriate instruction in terms of the LFIN at Level 4 (excellent). Only one survey respondent from each of the schools self-rated their understanding as excellent, but no interviewees did so. Interviewees' explanations of their ratings revealed that while many teachers felt they had learnt a great deal about the LFIN, their increased awareness had made them realise that they still had much more to learn about the Framework and how to use it to guide their instruction. This perception generally resulted in conservative self-assessments of their understanding of
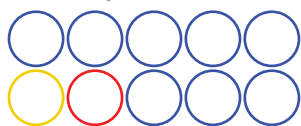
NEALS

the LFIN and their interpretation of its use. In particular, teachers from each of the schools remarked that while they may have felt very confident about their understanding of the LFIN and its implications for their programming when working with a particular group or stage of children, a recent shift in the grade they taught meant that they now had to broaden their understanding to include new aspects of the Framework. In such cases, teachers remarked that they required more time to build the same level of familiarity with the LFIN.

At the other end of the spectrum, interviewees felt that their need to refer to another staff member or support documentation to either verify students' placement on the LFIN or to select suitable activities for particular students, meant that their understanding of the LFIN was low and therefore rated it at only Level 1 or 2. An aspect of the CMIT program to be encouraged, is the degree to which professional conversations about the LFIN and associated learning experiences for students can assist within-school consistency and validity of teacher judgements. Additionally, such conversations have the potential to strengthen staff collaboration and continue to increase the professional knowledge of teachers. Hence, it is important that teachers do not shy away from seeking advice from other sources for fear that they may be considered to possess inadequate knowledge of the LFIN.

At School B, where the majority of interviewees had implemented CMIT for a number of years, four teachers expressed the desire to learn more about the 'theory' behind the Framework. This indicates their readiness to move to a more sophisticated level of operation with the LFIN. However, it also poses a potential problem regarding where and how these teachers might access this level of information. A possible solution for the future might lie in pre-service teacher education programs and their ability to include relevant theory as background in their mathematics education methods courses. As revealed by the current study, only one interviewee from each case study school had received any substantial introduction to the LFIN or an equivalent theoretical framework of children's arithmetical development during their initial teacher education. While a theoretical background by itself is insufficient for effective classroom implementation of such frameworks of learning, this information could at least provide the foundations of understanding upon which school-based professional development programs might build upon more easily.

A trend across all three case study schools was the link between the length of time that teachers had been involved with the implementation of CMIT and their self-identified level of understanding of the LFIN. In each case, the more time a teacher indicated they had been involved in the program, the more highly they tended to rate their understanding and level of confidence using it to plan for instruction. However, 'time' by itself was not the definitive factor for improving teachers' abilities to understand and integrate the LFIN into their pedagogy. Instead, it

NEALS

was shown that each of the schools had implemented strategies over this time to embed the LFIN more seamlessly into their programming and teaching. At School B, whole school professional development with an explicit focus on understanding the Framework was undertaken, at School A the Framework was prominently displayed in infant classrooms to guide instructional decision-making, and at School C, it was highlighted in teaching programs so as to inform the learning experiences provided to students.

RECOMMENDATION 2.1

Regular conversations focussing on the identification of students' strategy development, the Framework and appropriate learning experiences should be encouraged at the whole school and stage or grade levels to assist teachers validate their decision making and develop consistency in their judgements.

RECOMMENDATION 2.2

While initial and on-going professional development in CMIT and the LFIN, future development involving the LFIN should accommodate the needs of some teachers to delve deeper into the theory behind it.
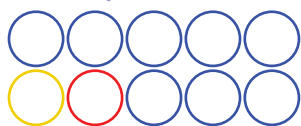
RECOMMENDATION 2.3

Teacher education programs should incorporate theoretical frameworks detailing children's cognitive development of mathematics into their pre-service early childhood and primary mathematics methods courses.

3. DO TEACHERS PERCEIVE THAT THE *LEARNING FRAMEWORK IN NUMBER* HAS IMPACTED ON TEACHING PRACTICES AT THE SCHOOL, CLASSROOM AND STUDENT LEVELS? IF SO, HOW? IF NOT, WHY?

Teachers' perceptions about the extent to which the Framework impacted on their teaching practices were obtained via Section 2 of the survey and from the interview. Additionally, verification of teacher perceptions was made possible through examination of the support documentation interviewees presented (school management plans and teaching programs) and when similar information was reported by a number of interviewees.

Survey respondents' perceptions as to the extent to which CMIT operated in their schools in terms of teaching and assessment practices varied slightly from school to school. While the majority of respondents from Schools A and C selected Group 2 or 3 Descriptors on the CMIT planning matrix for these aspects, respondents from School B tended to select Group 1 or 2 Descriptors. This means that the majority of respondents from School B considered themselves and their colleagues to have a thorough understanding of the LFIN and that this knowledge was used by teachers to guide their assessment and instructional decision making in the classroom. The robust implementation of CMIT perceived to be operating at School B by
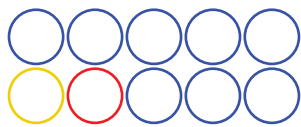
NEALS

survey respondents was consistently confirmed by other data. For instance, more survey respondents and interviewees from School B were able to clearly articulate how the LFIN could be used to assess students' strategy development and plan for appropriate instruction than from either of the other two schools.

Another recent change in practice that was noted by interviewees at Schools A and B was the perceived movement away from a reliance on repeated use of SENA testing as a source of information about students' strategy development to more continuous assessment methods via classroom observations and record keeping. This shift in practice is consistent with a more robust implementation of the CMIT program as described on the CMIT Planning Matrix.

Overall, participants considered the extent to which the LFIN influenced their personal instruction to be quite significant, with 17 out of 28 (60.7%) of survey respondents rating it at the top two levels. In particular, the Framework was perceived by interviewees at each school to be extremely influential in the instructional decision making of Kindergarten to Year 2 teachers more so than for teachers of other grades. As mentioned earlier, this was often perceived to be due to the extra time that CMIT had been operating in these grades as compared with that of other grades and the tendency for infant teachers to program collaboratively more often. For some teachers, the LFIN was considered more "user friendly", and therefore more influential, than the syllabus due to the detail about specific strategies and the sense of direction it provided for instruction of individual students.

In each of the case study schools, changes to the way teachers programmed, organised their students for instruction, and the way they taught their students were referred to by interviewees as a direct result of their CMIT training and their increased understanding of the LFIN. For instance, interviewees at each school made reference to strategies for differentiating tasks to suit the various abilities of their students. Teachers' programs sighted during interviews provided tangible evidence of such differentiation and indicated the extent to which CMIT activities had become embedded into the number programs at each school.

A number of interviewees expressed the view that an introduction to CMIT early in a teacher's career or at a point when a teacher experienced a shift to a different grade, meant that it was more likely to have a greater impact on the way they taught mathematics. These two points in a teacher's career were considered to be more influential when new information and teaching practices became firmly established as part of a teacher's routine practice. Importantly, those who wish to drive the professional development momentum at both the school and system levels should be aware and take advantage of these critical times in teachers' careers.

NEALS

RECOMMENDATION 3.1

Schools should encourage their teachers to move away from a reliance on repeated use of SENA testing as a sole source of information about students' strategy development to more continuous assessment methods via classroom observations and record keeping.

RECOMMENDATION 3.2

Schools should take advantage of critical transitional points in teachers' careers when professional development is most sought and influential in establishing long-term and robust teaching practices.

4. HOW CONFIDENT DO TEACHERS FEEL ABOUT IDENTIFYING CHILDREN'S LEVELS OF MATHEMATICAL DEVELOPMENT ON THE LFIN?
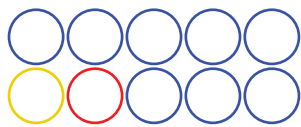
Information about how confident teachers' felt using the LFIN to identify students' mathematical development and to plan for appropriate instruction was gathered by the survey and during the interviews. As discussed in relation to research question 2, there was a clear trend across all three schools linking the length of time a teacher had been utilising CMIT to their self-rated confidence level. That is, the more time teachers indicated that they had been implementing the program, the more confident they felt about their understanding of the LFIN and their ability to use it to guide their assessment and instructional decision-making. As discussed earlier, 'time' by itself was not considered the determining factor for a teacher's improved confidence level. Rather, the professional support at the school and, in particular, the stage-level, was considered more influential.

RECOMMENDATION 4.1

Schools should focus on building collaborative support mechanisms in their schools to assist teachers embed aspects of the LFIN in their programming. Such mechanisms should be particularly focussed at building coherent Stage level teams.

5. TO WHAT EXTENT IS THE CMIT PLANNING MATRIX A USEFUL TOOL FOR IDENTIFYING THE LEVEL OF REPORTED IMPLEMENTATION OF THE PROGRAM AT THE SCHOOL AND CLASSROOM LEVELS?

Survey respondents were required to use the CMIT planning matrix to rate the degree to which they perceived the program operated in their schools and classrooms in terms of four aspects—Whole School Management, Teaching Practice, Assessment Practices and the Parent and Community Focus. Overall, within-school ratings were quite consistent for each aspect. In particular, every respondent from School A rated Parent and Community Focus at Level 4. Similarly, respondents from Schools B and C rated the same aspect at Level 3 or 4 Descriptors. It was also revealed that respondents from the same stage or grade level were more likely to rate aspects in a similar way with teachers of the higher grades tending to indicate that a

less comprehensive or robust form of CMIT was being implemented at their schools than teachers from K–2 grades. Most importantly, survey respondent ratings were generally consistent with other data sources. For example, ratings by School B respondents indicated that there was a fairly robust implementation of CMIT for most aspects on the matrix at that particular school. This in fact was found to be the case. Interviewees described practices and provided documented evidence that 'Descriptors' from Level 1 and 2 of the matrix were indeed occurring at School B. In this case, the CMIT planning matrix proved to be a fairly accurate instrument for gauging the level of implementation of the program and has the potential to act as a guide to other schools wishing to enhance their involvement in the program.

RECOMMENDATION 5.1

Schools should use the CMIT planning matrix to monitor the degree to which CMIT operates in their schools according to all four aspects contained in the matrix. Such regular self-assessment will assist future development of the program, increase the professional dialogue surrounding the program and improve communication as to the consistency to which CMIT is operating at the whole school and classroom levels.

NEALS

The *Learning Framework In Number* and its Impact on Teacher Knowledge and Pedagogy

Introduction

This report presents the findings of an investigation into the *Count Me in Too* numeracy program operating in Department of Education and Training (DET) primary schools throughout New South Wales. Data for the study were collected from August to November, 2008. The study focuses on teacher knowledge of the *Learning Framework In Number* (LFIN)—a researched-based framework describing children's cognitive development in early number.

Background

The *Count Me In Too* (CMIT) numeracy program is an on-going professional development initiative of the Department of Education and Training in New South Wales (NSWDET, 2007). Its two main aims are to help teachers understand children's mathematical development and to improve children's achievement in mathematics. CMIT began in 1996 as a pilot program involving 13 schools and gradually expanded to involve nearly 1700 primary schools over a ten-year period across the state. Key aspects of the program include the *Learning Framework In Number* (LFIN) and a diagnostic interview or *Schedule for Early Number Assessment* (SENA) (Wright, Martland & Stafford, 2006). The LFIN is used by teachers to not only identify the level of development each child has attained but provides instructional guidance as to what each student needs to work towards.

The *Learning Framework In Number*

Learning frameworks, also known as progress maps or learning trajectories provide a description of skills, understandings and knowledge in a sequence in which they typically occur, thus giving a virtual picture of what it means to progress through an area of learning. Thus they provide a pathway or map for monitoring individual development over time. A student's location on a framework can be utilized as a guide to determining the types of learning experiences that will be most useful in meeting the student's individual needs at that particular stage in their learning. A number of professional development programs now exist that utilize such theoretical frameworks with the aim of increasing teachers' understanding of children's mathematical thinking (e.g., Bobis et al., 2005; Carpenter et al., 1999; Van den Heuvel-Panhuizen, 2001).

The CMIT *Learning Framework In Number* was initially developed by Wright (1994) and has since undergone further development through the impact of a wide range of research in early number (e.g., Bobis, 1996; Gravemeijer, 1994; Mulligan & Mitchelmore, 1997). In brief, the LFIN consists of nine key and interrelated components:
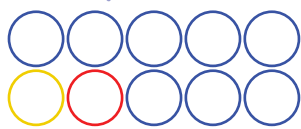
Numeral Identification

1. Number word sequences by 10s and 100s

2. Forward number word sequences

3. Backward number word sequences

4. Building addition and subtraction through counting by ones

5. Building addition and subtraction through grouping

6. Building place value through grouping

7. Building multiplication and division through equal counting and grouping

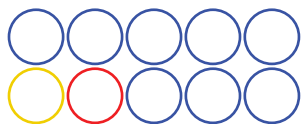8. Building fractions through sharing and partitioning

The LFIN provides a description of the knowledge and skills characterising major stages of development in each of these components. Teachers use these stage descriptions to profile their students' knowledge in each key component. Such information then provides instructional guidance as to what each student needs to progress. An important step in a teacher's ability to utilise the framework in their instructional decision-making is their understanding of how all components are interrelated. For a more detailed description of the LFIN see Wright, Martland and Stafford (2006) and NSWDET (2007).

Research by Cobb, Yackel and Wood (1992) and others (e.g., Swafford, Jones & Thornton, 2000) indicates that knowledge of children's mathematical thinking is particularly influential in changing teachers' instructional strategies and can potentially increase their abilities to cater for various levels of children's mathematical understanding. It is therefore critical to explore teachers' knowledge of the LFIN and the extent to which such knowledge impacts on their instructional decision-making to ensure professional development programs can best accommodate the needs of our teachers.
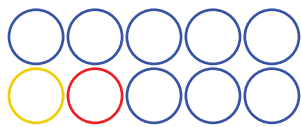
AIM OF THIS STUDY

The aim of this study is to explore teacher knowledge of the *Learning Framework In Number* (LFIN) from the *Count Me In Too* numeracy program and the impact this knowledge has on their pedagogy. In particular, the study addresses the following research questions:

1. What are teachers' perceptions about the degree to which CMIT is being implemented at the school and classroom levels?

2. What are teachers' perceptions about the extent of their knowledge of the *Learning Framework In Number*?

3. Do teachers perceive that the *Learning Framework In Number* has impacted on teaching practices at the school, classroom and student levels? If so, how? If not, why?

NEALS

4. How confident do teachers feel about identifying children's levels of mathematical development on the LFIN?

5. To what extent is the CMIT planning matrix a useful tool for identifying the level of reported implementation of the program at the school and classroom levels?

RESEARCH DESIGN

Three primary schools were purposively selected by NSW Department of Education and Training authorities and then invited to participate in the study. Criteria for selection were based on a school's action plan detailing 2008 outcomes and processes for the implementation of CMIT in their school and their willingness to participate in the evaluation. A case study of each school was compiled that specifically focused on teacher knowledge of the *Learning Framework In Number* and its impact on their pedagogy.

Information was gathered from three main sources:

1. Survey;

2. Semi-structured interviews with staff from each of the schools; and

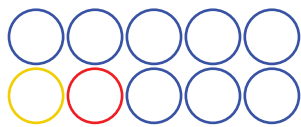3. Documents (such as school management plans and teacher programs).

PROCEDURE AND INSTRUMENTS

THE SURVEY

The survey (see Appendix C) consisted of three main sections. The first section sought biographical and contextual information about the school and the individual teacher completing the survey. Section 2 consisted of the CMIT planning matrix (see Appendix B). This matrix consists of 'descriptors' of various aspects of CMIT (including the LFIN) that are arranged in four categories—School Management, Teaching practice, Assessment and Parent and Community Focus—and four 'levels' of implementation. The matrix was initially developed by NSWDET authorities to assist schools in their planning and implementation of CMIT. Teachers were asked to rate the level they perceive best describes the implementation of CMIT at their school and in their own classroom.

The third section of the survey required an open-ended response to a scenario involving a description of a student's reaction to a mathematical task. Teachers were asked to use the available evidence to approximate the child's performance as described by the LFIN and to make suggestions about the types of activities/learning experiences that would most suit the child's level of understanding. The survey was completed anonymously by teachers at their own convenience and then placed in individual, unmarked envelopes. The sealed envelopes were submitted to the school office and collected by the researcher at the time of the school visit. Respondents completed the survey approximately 2 weeks prior to the school visit by the researcher to conduct interviews.

NEALS

THE SEMI-STRUCTURED INTERVIEWS

K–4 teachers, executive staff and the CMIT facilitator (if different from K–4 staff) at each school were invited to be interviewed following-on from the survey. At least one Year 5 and/or 6 teacher from both Schools A and B were interviewed due to their executive status on staff or because of their close involvement with the CMIT or Counting On programs in their respective schools. A total of 22 interviews were conducted, comprising 8 teachers from School A and 7 teachers from both School B and School C. Each interview took approximately 45 – 60 minutes and was conducted in a private office within the school grounds during school hours. Relief teaching was provided for the duration of the interview so that teachers were not inconvenienced by time taken for the interview.

The interviews established background biographical details for each interviewee before seeking information specifically related to professional learning and the implementation of CMIT and the LFIN. Teachers were asked about their confidence concerning the identification of individual students' on the LFIN and the subsequent planning for student instruction. The interviews were digitally recorded and later transcribed for the purpose of analysis. All teachers' names and the names of their schools occurring in the results section of this report have been substituted with an alias.
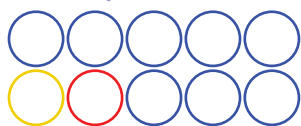
DOCUMENTS

It was requested that teachers bring documents such as school management plans and individual or collaborative teacher programs to the interviews to help support their oral explanations of planning and teaching practices. Examples of these documents were collected from each case study school.

ANALYSIS

Descriptive statistics were used to analyse the items on the survey requiring teachers to provide quantitative responses (Sections 1 and 2 of the survey). The third section of the survey required an open-ended response to a scenario involving a description of a student's response to a mathematical task and was intended to elicit teachers' knowledge of the LFIN, establish their ability to approximate a child's performance as described on the *Framework* and to make appropriate instructional decisions about the types of activities/learning experiences that would most suit the child's level of development. Responses to this section were analysed according to a rubric, derived from the CMIT planning matrix (see Appendix B) and designed to distinguish the extent of respondents' understanding of the LFIN and its impact on their instructional decision-making (see Table 1). It must be emphasized that an allocation to a particular level on the rubric does not indicate
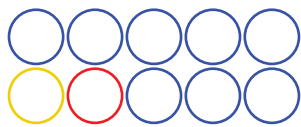
that one teacher is considered a better teacher than any other—it simply means that they were considered to have a different level of understanding of the *Framework* or were perhaps less or more likely to utilise the LFIN in their instructional decision-making.

Interview data were transcribed and read for emerging themes. Responses to questions requiring interviewees to indicate a rating from 0 to 4 for certain aspects of their knowledge and utilisation of the LFIN were collated for each school.

Documents in the form of school management plans and individual teacher programs were analysed in conjunction with interview data since all documents provided by teachers were intended to support, elaborate and verify their responses to interview questions. Teacher programs and lesson plans, when available, were analysed to determine the type and level of impact the LFIN had on planning for student learning at the school and classroom levels.

RESULTS

Following a brief introduction to the background of each school, information obtained from the survey will be presented for all schools. Data collected during site visits via interviews and documents will be presented and discussed separately for each school.

BACKGROUND TO CASE STUDY SCHOOLS
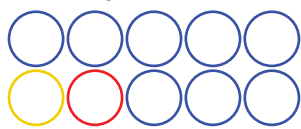
SCHOOL A

Case study School A is situated in an urban environment in the Sydney Region. With a student population of approximately 480—a high proportion of whom are of Asian descent—the school serves a diverse multicultural community from mostly middle socio-economic backgrounds.

CMIT has been operating in the Infant classrooms for approximately 3 years at School A and in 2008 it was, for the first time, being implemented Kinder to Year 4 (one Year 5 teacher with a high proportion of low achieving students was also CMIT trained). However, with staff turnover and internal shifts of teachers between grades, the experience of teachers actually implementing CMIT in their classrooms ranges from just 3 months (Year 5/6 classroom teacher and executive staff member) to 7 years (Kindergarten teacher with CMIT experience from a previous school), with only one teacher of 3 years experience having been introduced to the theoretical aspects of CMIT and the LFIN during her teacher education at university.

SCHOOL B

Case study School B has a student population of approximately 356 students and is situated in the South Western Sydney Region. Ninety-two percent of the students are from non-English speaking backgrounds, predominately of Arabic origin (63%). The school is part of the Priority Schools Funding Program as it serves a low socio-economic community.

Of the 26 teaching staff, 36% are in their first five years of teaching. Experience implementing CMIT in the classroom varied from just 5 months for a Year 1 teacher to almost 8 years for another Year 1/2 teacher who had been introduced to the program in her first year of teaching at the current school. Only one teacher (Year 1 teacher with 3 years teaching experience) had been introduced to the theoretical aspects of CMIT and the LFIN during her teacher education at university. The average length of involvement in the program of all staff responding to the survey is 5 years, making the staff of School B the most experienced CMIT users of all three case study schools in terms of actual 'time' spent implementing the program.

SCHOOL C

Situated in the South West Sydney Region, School C has a student population of approximately 330 students—40% of whom come from an Arabic-speaking background. The school is part of the Priority Schools Funding Program due to the significant number of families from low socio-economic backgrounds. As a result the school receives additional support in terms of funds and staffing that are directed to Literacy and Numeracy resources and programs throughout the school.

Staff ranged in teaching experience from less than a year to 16 years, with an average of just over 2 years experience implementing CMIT. Only one Year 2 teacher, with just 3 years teaching experience had received CMIT instruction while undertaking her teacher education at university.

SURVEY RESULTS

Twenty-eight surveys were returned from the three case study schools—10 from both School A and School C and 8 from School B. Section 1 of the survey collected contextual information about the individual schools and respondents. This information was reported in the previous section on backgrounds to case study schools. Section 2 of the survey required teachers select the level they perceived best described the implementation of CMIT at their school and in their own classroom. The level descriptors were taken directly from the CMIT planning matrix prepared by the NSWDET authorities to assist schools self-identify and to plan for progressive improvement in the level of CMIT implementation at the school, classroom and community areas. A rating of Level 1 is considered to reflect a more robust implementation of CMIT, whereby most aspects would be seamlessly integrated into normal administration and teaching practices. At the opposite end of the scale, a Level 4 rating is considered to reflect a potentially superficial or rudimentary implementation of some aspects of the program and little or no implementation of other aspects. Results of this section are reported separately for each school but some comparisons between schools are made where appropriate.

SECTION 2 SURVEY RESULTS

Figure 1 presents the results for all 10 respondents of the survey from School A, Questions 1 to 4 of Section 2. It can be seen that overall there was a fair amount of consistency in teacher ratings, particularly for Question 4 when teachers were asked to select the group of descriptors that best described the way CMIT has a 'Parent and Community Focus' in their school. All teachers selected Descriptor Group 4 for this aspect, indicating that parents may have minimal involvement in CMIT and limited information about how it operates in the school.
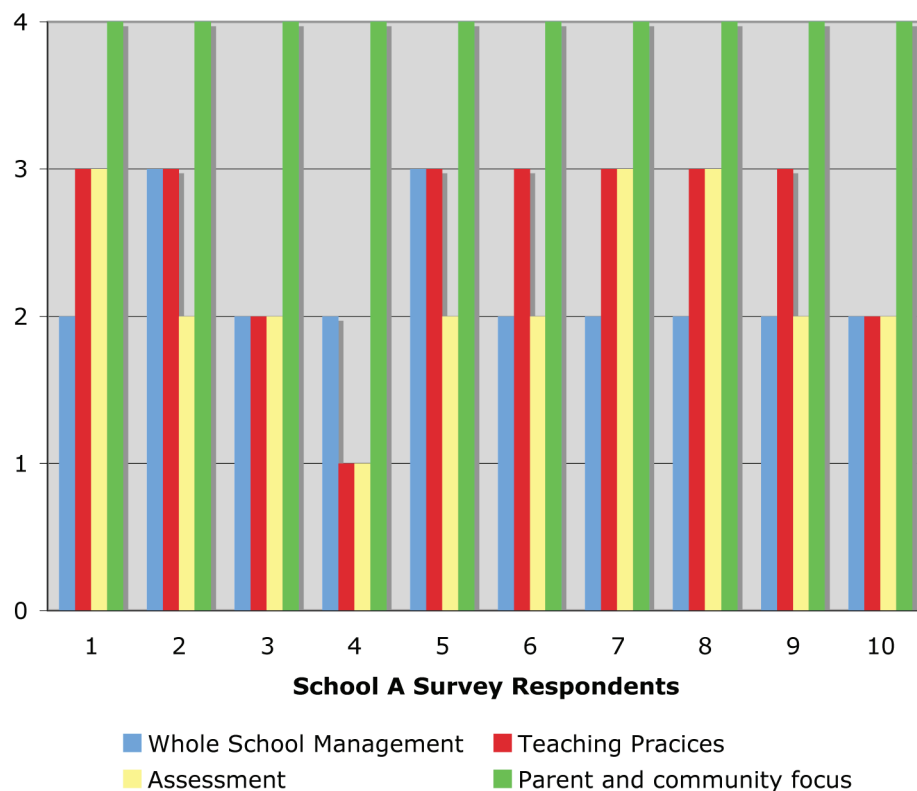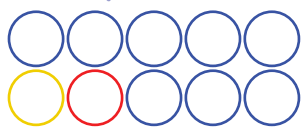
NEALS

Figure 1. School A survey responses to school and classroom aspects of CMIT Section 2 Questions 1 – 4.

All but two of the respondents considered that Descriptor Group 2 best describes the way CMIT operates in their school at the whole school management level. This means that CMIT is perceived by the majority of respondents to be operating at quite a sophisticated level according to the planning matrix (Appendix B). For instance, a 'Stage team' approach to CMIT planning takes place, with ongoing professional learning meetings occurring, provisions for the training of new staff and improvements in teaching and learning is evident as a result of CMIT implementation.

Regarding teaching practices at the classroom level, seven of the respondents considered CMIT to be operating most like the descriptors contained in Group 3. That is, the results of individual assessment interviews (SENA results) and the LFIN are used initially to form ability groups but there may be limited opportunities for students to move between groups throughout the year. Teachers operating at this level of CMIT implementation generally encourage students to explain their mathematical thinking strategies and incorporate concrete materials into chosen learning experiences. Two respondents considered that teaching practices operate at the second level (Respondents 2 and 10) while another (Respondent 4) thought a more robust implementation was evident, giving a Level 1 rating.
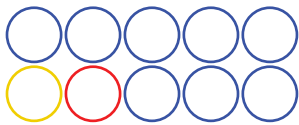
Assessment descriptors were perceived to be operating similar to Group 2 by the majority of School A survey respondents, with others selecting Group 1 and Group 3 Descriptors. This indicates that at the very least, all respondents considered that student progress is monitored via the SENA, with the majority agreeing that teachers generally understood the LFIN and used it flexibly to guide assessment and grouping for instructional purposes.

Figure 2 presents the same information for School B. Taken as a whole, the results indicate a more robust implementation of CMIT is occurring at this school than either School A or School C. There were more individual respondents selecting Descriptor Group 1 and 2 ratings relating to all aspects on the CMIT planning matrix than in the other case study schools—except for the Parent and Community Focus, but this is still considered by the majority of respondents to be operating in a more robust way than elsewhere. In particular, five of the eight respondents considered assessment practices at the school were best described by Group 1 or 2 Descriptors. This means that the majority of respondents perceived there to be an understanding by teachers at School B of the LFIN and that flexible use of the SENA guided their assessment of students and informed their instructional practices. Similarly, the majority of respondents selected Group 1 or 2 Descriptors to indicate the extent to which CMIT impacted on teaching practices at the classroom level. Again, this indicates that the majority of respondents from School B consider themselves and their colleagues to have a thorough understanding of the LFIN and that this knowledge is used by teachers to guide their instructional decision making.
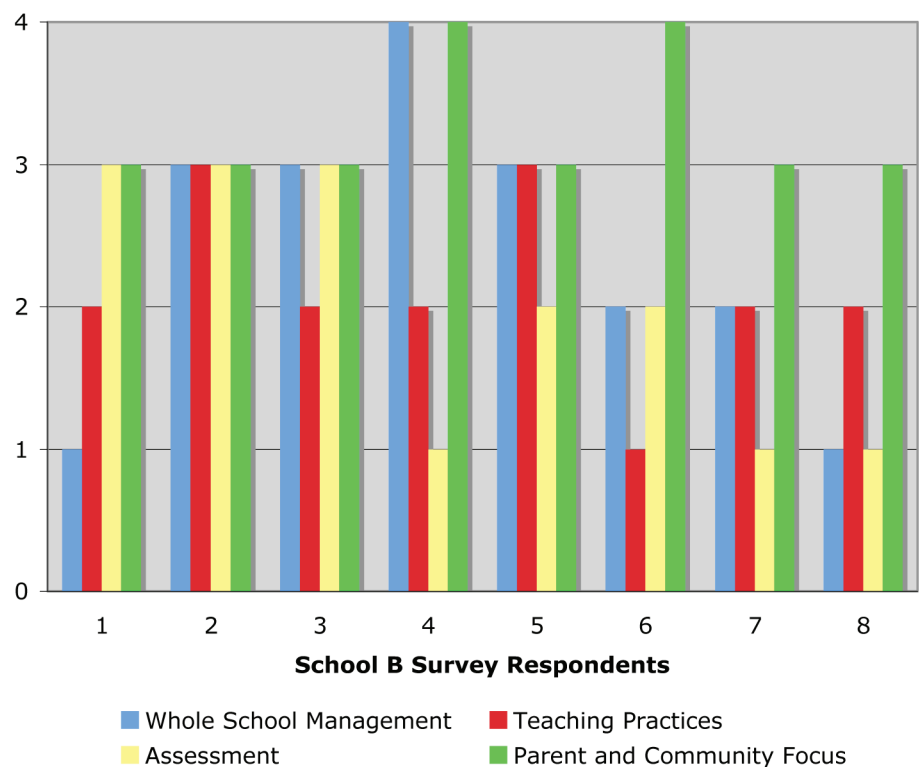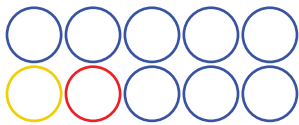

School B Survey Respondents

■ Whole School Management   ■ Teaching Practices
■ Assessment   ■ Parent and Community Focus

Figure 2. School B survey responses to school and classroom aspects of CMIT Section 2 Questions 1 – 4.

NEALS

Case study School C results for Section 2 Questions 1 to 4 are represented in Figure 3. Overall, the 10 survey respondents from School C indicate that CMIT is perceived to be operating around Descriptor Group 2 or 3 levels for most aspects of the program. No respondent used descriptors from Group 1—the most robust implementation of CMIT as described in the Planning Matrix—to describe any aspect of CMIT. Similar to perceptions at School A, the majority of respondents consider the Parent and Community Focus of CMIT to be operating at Group 4 Descriptors, but with some indicating Group 3, possibly due to the use of parent-helpers in the K–2 classrooms.

Whole school management descriptors were considered by just over half of School C respondents (six out of ten) to be operating at Group 2, with all others selecting Group 3 descriptors. This means that for the majority of respondents, a Stage team approach to the coordination and planning of CMIT is operating and that provision for new staff to be trained is available. It also indicates that professional learning in CMIT is being provided, possibly by the school-based facilitator, and that external support is also sought.

The two respondents indicating a Group 2 Descriptor for the way CMIT operates in relation to Teaching Practice were both Kindergarten teachers. This suggests that CMIT might be operating in a more robust way for some teaching Stage teams than others at School C.
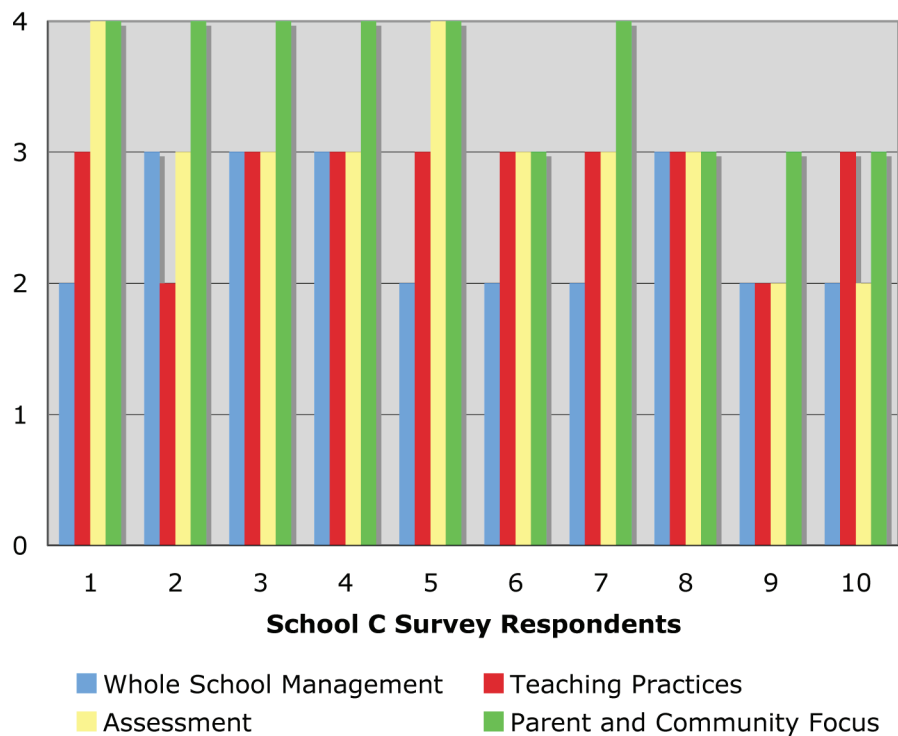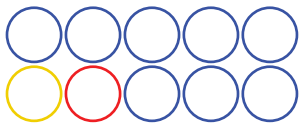

School C Survey Respondents

- Whole School Management
- Teaching Practices
- Assessment
- Parent and Community Focus

Figure 3. School C survey responses to school and classroom aspects of CMIT Section 2 Questions 1 – 4.

11

Questions 5 to 8 of Section 2 on the survey aimed to elicit respondents' personal perceptions about the level to which they understood and felt confident using the LFIN to assess children's learning and plan appropriate instruction. Teachers were asked to use a rating scale from 0 (no understanding or confidence) to 4 (excellent /extensively). Hence, for this set of survey questions, the higher ratings generally indicate more desirable and confident responses in terms of teachers understanding of the LFIN and the perceived extent to which it impacted on their pedagogy. However, without an explanation or rationale for each rating, caution should be used interpreting the results. For instance, during site visits, interviewees were asked to rate themselves on similar items and to explain their rating. While some interviewees rated themselves only a 1 or a 2 for their understanding of the LFIN (e.g., Respondent 5 from School A), some explained the fairly low rating was because they now know that they "have a lot more to learn". This may also be a reason why some teachers did not wish to indicate Excellent (Level 4) for any aspect of their understanding of the LFIN despite their obvious familiarity working with the LFIN in the classroom. Hence, because clarification of ratings was sought during site visits, results will be discussed in more detail when interview data is presented for each school. An overview of the results for the survey questions for each school now follows.

The results for School A survey responses to Section 2 Questions 5 to 8 are presented in Figure 4.

School A Survey Respondents

- ■ Personal Understanding of LFIN
- ■ Extent to which LFIN increased awareness children's development of number
- ■ Confidence identifying Stage of development on LFIN
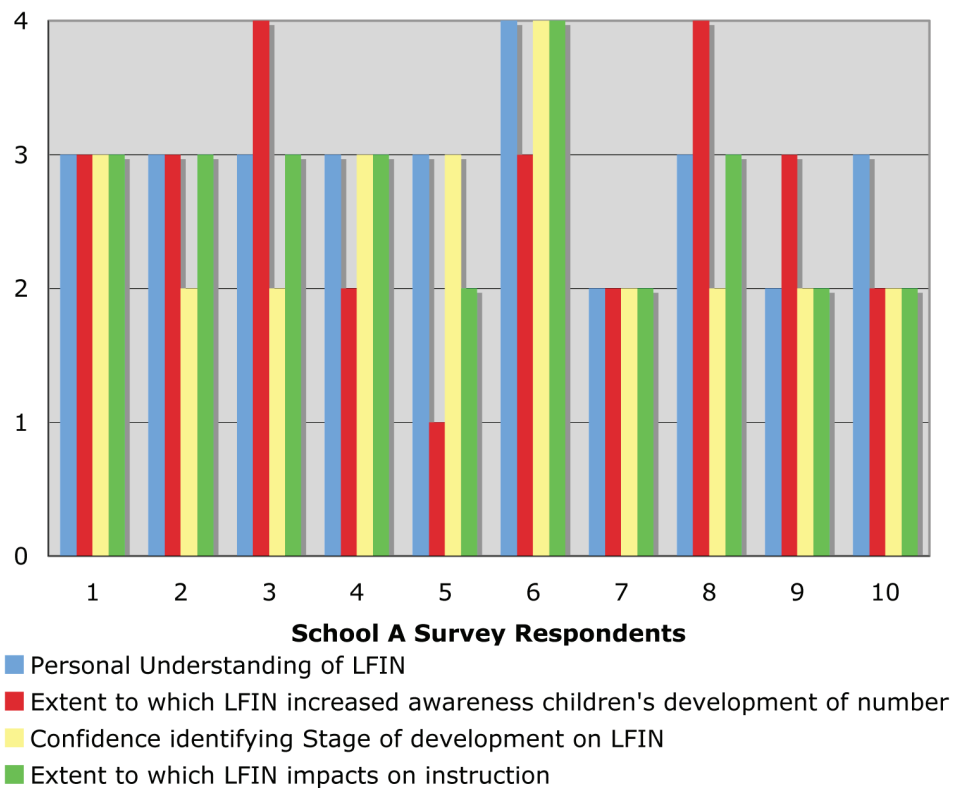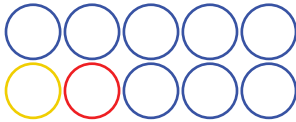- ■ Extent to which LFIN impacts on instruction

Figure 4. School A responses to Section 2 Questions 5 - 8

NEALS

Generally, respondents rated their understanding of the LFIN as Adequate (Level 2) or higher with the majority considering their understanding as Good (Level 3). Respondent 6, who displayed the most positive responses overall, indicated on the survey that she is also the CMIT Facilitator so it is understandable that this respondent would be more experienced and confident in most aspects of the LFIN and its impact on instruction. Six respondents (Respondents 2, 3, 7, 8, 9, and 10) rated Question 7 (confidence identifying a student's stage of development on the LFIN), as only Adequate. Once again, explanations for these ratings are important and will be reported with the interview data. However, given that four School A respondents indicated that they had less than 12 months experience implementing CMIT in their classrooms (Respondents 2, 5, 9 and 10) it is highly likely that this lack of experience influenced their self-ratings on these items.

Survey respondents from School B (see Figure 5) generally indicated a 'Good' (Level 3) rating to each of the questions concerned with their understanding and implementation of the LFIN. Half of the respondents considered that there had been 'Extensive' (Level 4) increases in their awareness of children's development in number knowledge and strategies as a result of their introduction to the LFIN. Only one respondent (Respondent 5) selected ratings at 'Minimal' (Level 1) for their understanding, increase in awareness and for their confidence identifying the stage of development using the LFIN. Interestingly, the same respondent considered that the LFIN had a Level 2 impact on their instruction. Clarification as to the rationale for Respondent 5's ratings may be provided by a closer examination of the interview data discussed later in this report.

School B Survey Respondents

- Understanding of LFIN
- Extent LFIN increased awareness of children's number knowledge
- Confidence identifying Stage of development on LFIN
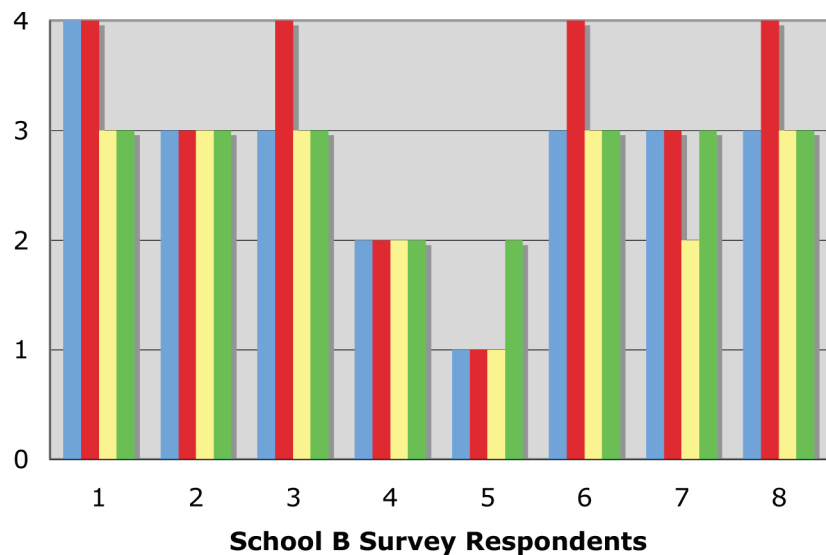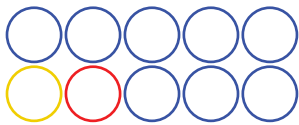- Extent LFIN impacts on pedagogy

Figure 5. School B responses to Section 2 Questions 5 – 8

NEALS

Results for the same items for School C respondents are presented in Figure 6. Taken as a whole, the range in responses is more varied than for Schools A and B with a greater number of respondents selecting Level 1 or 2 ratings to describe their understanding and confidence working with the LFIN. Importantly, respondents who rated any aspect relating to their knowledge and implementation of the LFIN as a Level 3 or 4 were either Kindergarten teachers (Respondents 2, 3 and 9), the CMIT Facilitator (Respondent 8) or executive staff (Respondent 1 Year 5 teacher) with at least 4 to 5 years experience working with CMIT in their classrooms. The remaining respondents (Respondents 4, 5, 6, 7 and 10) each had less than 2 years experience implementing the program with Respondent 10 indicating less than a few months experience. Respondent 3, who indicated the highest level of confidence about their understanding of the LFIN and their ability to use it to identify children's developmental stages and plan for instruction also had the greatest number of years experience working with CMIT in the classroom (approximately 6 years). While reasons for individual ratings still need to be clarified via interview data, there is a clear trend at School C indicating that the more exposure to CMIT the more teachers felt confident about their understanding of the LFIN and their ability to use it to guide their assessment and instructional decision-making.
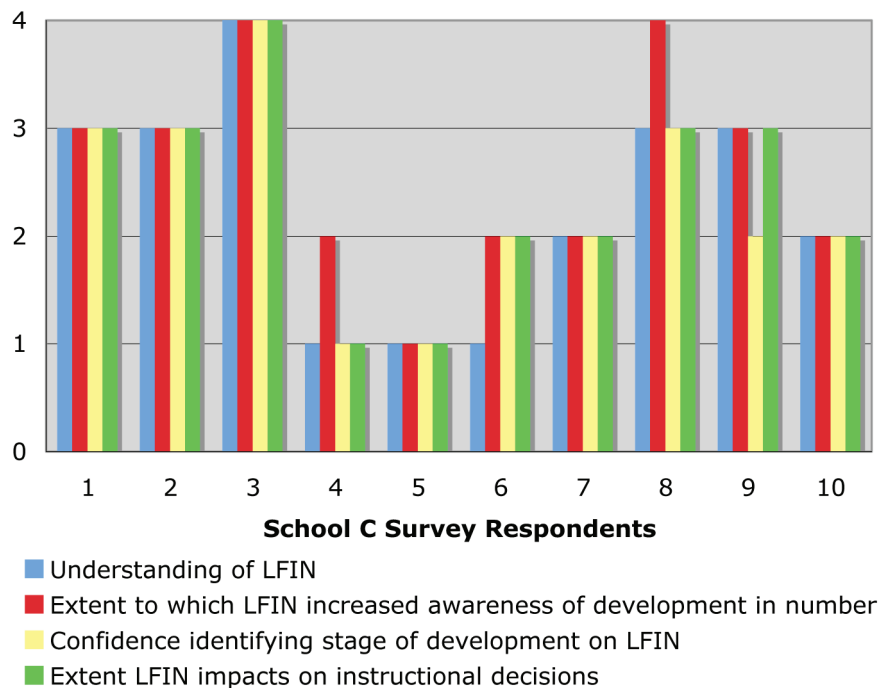

School C Survey Respondents

■ Understanding of LFIN
■ Extent to which LFIN increased awareness of development in number
■ Confidence identifying stage of development on LFIN
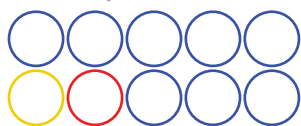■ Extent LFIN impacts on instructional decisions

Figure 6. School C responses to Section 2 Questions 5 - 8

SECTION 3 SURVEY RESULTS

Section 3 of the survey presented an excerpt from an interview in which a child's early arithmetical strategies were being assessed. Respondents were required to respond with advice for the teacher of
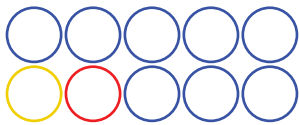
NEALS

this child regarding (a) the child's numerical development, and (b) what to teach the child. Due to the enormous variation in responses to this item, a rubric was established to assist with analysis of respondents' comments. The rubric, along with the number of respondents from each school falling into each level and sample responses, is presented in Table 1. As indicated earlier, an allocation to a particular level on the rubric does not indicate that one teacher is considered a better teacher than any other—it simply means that they are considered to have a different level of understanding of the LFIN, can articulate a response more clearly, or are perhaps less or more likely to utilise the LFIN in their instructional decision-making.
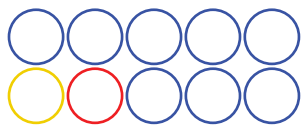
TABLE 1

Rubric for analysing teachers' responses to the assessment scenario (Section 3) of the survey School A (n = 10), School B (n = 8), School C (n = 10), Total (n = 28)

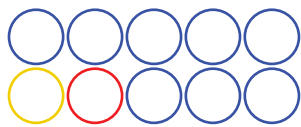| Level	Number of teachers responding at each level per school & total (%) for all schools	Description of response level	Sample responses and list of respondents in each category
0	School A = 2 School B = 0 School C = 3 Total = 5 (17.8%)	No response, unreasonable or inappropriate response indicating little/no understanding of task or unable to make sense of response.	No response (Respondents 10, 20 & 25). Depends on how old the child is (Respondent 23). Respondents 4, 10, 20, 23, 25

NEALS

1	School A = 3 School B = 2 School C = 3 Total = 8 (28.5%)	Strategy development described or LFIN referred to but inappropriate stage selected. No follow-up suggested or some understanding evident of follow-up activities but may not be the most appropriate given stage selected.	Child is counting from 1 for addition (Respondent 7) Teach them to count-on for quicker number recognition (Respondent 9) Child is emergent and needs the more efficient method of counting-on from larger number (Respondent 14) Respondents 6, 7, 9, 14, 15, 19, 21, 22
2	School A = 3 School B = 1 School C = 3 Total = 7 (25%)	Appropriate strategy described or LFIN referred to. Follow-up learning experiences mostly appropriate.	Perceptual level. Teach child to count on from the larger number (Respondent 17) Respondents 1, 2, 5, 17, 24, 27, 28

| 3 | School A = 2
School B = 4
School C = 1
Total = 7 (25%) | Comprehensive understanding of strategy development LFIN and/or uses LFIN to justify choice of appropriate follow-up learning experiences. | Student is Perceptual moving to Figurative. Needs to recognise concealed numbers e.g. conceal some counters and say how many altogether. Child must calculate how many are concealed. (Respondent 3)

Level 1 Perceptual. Still needs concrete materials and counts from 1. Reinforce counting forwards and backwards to increase confidence, working towards counting on from numbers other than 1. Activities such as 'Rabbit ears' will help reduce reliance on concrete materials (Respondent 16)

Respondents 3, 8, 11, 12, 16, 18, 26 |

Three survey respondents (1 from School A and 2 from School C) did not respond to this section on the survey so were given an automatic Level 0 rating according to the rubric. Only two other respondents received this level rating due mainly to the fact that their answers did not explicitly address the question.

Seventy-eight percent of respondents (23 out of 28) provided responses that were rated at Level 1 or above, with 50% receiving ratings in the top two levels. Respondents from Schools A and C dominated Level 1 and 2 ratings indicating that respondents from these two schools were clearly able to use the available information to either identify the type of strategy used by the child in the scenario or suggest appropriate follow-up instruction. However, Level 1 type responses usually did not refer to a specific stage from the LFIN or, if they did, they selected the wrong strategy 'label'. For instance, Respondent
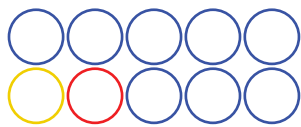
NEALS

14 suggested the child was demonstrating 'Emergent' characteristics when a 'Perceptual' strategy assessment is more appropriate.

Respondents providing Level 2 type responses usually provided an appropriate description of the strategy being used by the child or used the correct terminology from the LFIN. However, they normally suggested follow-up instruction indicating the child now needed to "count-on from the larger number" (e.g., Respondent 17). While this is certainly a necessary strategy development suggestion for the future of this child, there are a few more urgent skills and processes this child needs prior to being able to develop the more sophisticated strategy of counting-on. Such appropriate strategy development was more typically suggested by responses rated as Level 3.

Level 3 type responses were provided by a quarter of all respondents. Such responses provided evidence of a comprehensive understanding of strategy development via their ability to analyse the information provided in the scenario. They were also able to use their knowledge of the LFIN and strategy development to justify their choice of appropriate follow-up learning experiences. For instance, Respondent 16 detailed how the child in the scenario "Still needs concrete materials and counts from 1. Reinforce counting forwards and backwards to increase confidence, working towards counting on from numbers other than 1." The same respondent was also able to suggest appropriate activities such as 'Rabbit ears' and to justify their selection: "(This) will help reduce (the child's) reliance on concrete materials".

Over half of the responses demonstrating Level 3 characteristics were from School B respondents. Consistent with results from Sections 1 and 2 on the survey, respondents from this school not only possess the most experience with CMIT in terms of the number of years they have implemented it in their classrooms, but they also generally rate themselves more highly in terms of their confidence in understanding and using the LFIN to guide their instruction. Importantly, the trend across all three case study schools linking length of time in which respondents have implemented CMIT with their self-identified levels of understanding, and confidence using, the LFIN is further supported by the results of Section 3 on the survey. However, it should not be assumed that 'time' by itself is the definitive factor for improving teachers' abilities to understand and integrate the LFIN into their pedagogy. The interview data will be critical in identifying what these schools are doing with their 'time' that seems to be having such a positive impact on teachers' abilities to implement CMIT.

INTERVIEW AND DOCUMENT DATA

A major purpose of the interviews was to validate information obtained from the survey data collected from each of the case study schools. In particular, interviews were a critical means by which teachers' reasons for their personal ratings about the LFIN and its perceived impact on their knowledge and instructional decision-making could be verified. The interviews established background biographical details for each interviewee before seeking information specifically related to professional learning and the implementation of CMIT and the LFIN. Teachers were then asked about their confidence concerning the identification of individual students' on the LFIN and the subsequent planning for student instruction (see Appendix D for the interview questions). The discussion of interview data for each case study school is presented separately. Where appropriate, comparisons between schools are made to help highlight commonalities and differences. Individual and stage-team teaching programs were presented by a few interviewees at each of the schools to help explain and justify descriptions of their planning and teaching practices. Reference to these documents is integrated into the discussion of interview data.

SCHOOL A

Eight teachers from School A were interviewed, including two Kindergarten teachers (one of whom is the newly-appointed Facilitator), one Year 1 teacher, four teachers of mixed Year 3/4 classes and one Year 5/6 teacher. As mentioned earlier, CMIT had been operating in Infant classrooms for the past three years and was only introduced to teachers of Years 3 and 4 in term 2 of the current year. Hence, despite most interviewees being quite experienced teachers (five out of eight teachers had more than 6 years experience and two had more then 10 years experience), the majority of teachers interviewed had only one year or less experience implementing CMIT. The Facilitator, on the other hand, had implemented the program at a previous school so had more than 7 years experience. Background information for each interviewee, along with their self-ratings for their understanding and confidence using the LFIN is presented in Table 2.
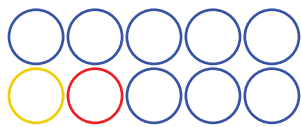
Table 2. Summary of background information and their self-ratings
*for their understanding and confidence using the LFIN*

Interviewee	Grade	Approx. Months/Yr using CMIT	Self-rating for Understanding of LFIN (0 to 4)	Self-rating for extent LFIN increased awareness of number development	Self-rating for Confidence using LFIN (0 to 4)
1. Jane	5 & 6	5 months	2	4	3
2. Kathy *	K	8 years	3	3	3
3. Roberta	3 & 4	5 months	2	3	2
4. Lilly	1	<1 year	3	4	3
5. Lana	3 & 4	<1 year	2	2	3
6. Ann	K	2 years	3	3	3
7. Kate	3 & 4	<1 year	1	2	1
8. Mark	3 & 4	<1 year	2	4	3

* CMIT Facilitator

Generally, teachers at School A received their CMIT training in stage teams. This was considered a benefit by Ann, a Kindergarten teacher, because "you can discuss it with everyone … you start to plan what you're going to change and you have that shared experience to refer back to". Similarly, a Year 4 teacher with only a few months experience implementing CMIT, considered the team training "a real positive thing, because we've been able to pull out the *Framework* (at stage meetings) and everybody knows what it's about" (Mark). The fact that nearly the entire K–4 staff was implementing CMIT meant that "we've got that flow of information coming up about the kids" and there is a lot more "sharing of information" with teachers from other stages.

Sharing of information across stages and whole school professional development in CMIT was further fostered through a process of classroom observation visits. Ann explained, "Kindergarten teachers saw two Stage 1, and the Stage 1 saw a Kindergarten and a Stage 2, and Stage 2 teachers saw a Kindergarten and Stage 1". Pre-observation visits to "break the ice" and debriefing sessions were considered to have "opened-up the professional discussion" as teachers started asking one another for specific ideas about how to teach concepts they did not feel confident teaching.

Another positive outcome from undertaking training in groups noted by interviewees at School A, was how changes to programming and teaching practices occurred more easily and were consistent amongst stage team members. For instance, Mark noted that Stage 2 teachers

NEALS
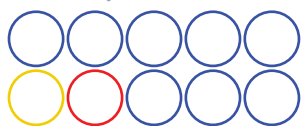
…came away from the course thinking that there will have to be some changes here. Our current way of teaching and programming isn't going to facilitate the journey. So we threw some ideas around. … together we came up with a model that would let the *Framework* flow through.
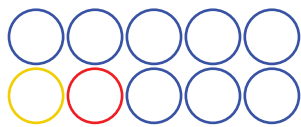
Changes to teaching practices as a result of CMIT training was mentioned by all interviewees and particularly highlighted by teachers from Kindergarten to Year 4. Ann (Kindergarten teacher) commented "my practice is very different now because of CMIT. There's a lot more differentiation in the tasks I'm giving the kids". A Year 5 teacher who had received CMIT training only a few months ago "started using it straight away because I found it was very useful—I have some very low achieving kids" (Jane). However, due to the fact that she was the only Year 5 teacher implementing CMIT, she felt she did not "get the same level of professional discussion" with the other Stage 3 teachers "because they don't know the *Framework* like me; they often don't need to, because most of their kids are beyond it". Unlike the practices of K–4 teachers where the Framework overtly informed the programming—its structure and content—Jane keeps the LFIN "in the back of my mind all the time. I have to think how I can adapt the activities so that all levels of students can succeed".

A focus on the *Learning Framework In Number* was evident in the teaching practices and documentary evidence provided by K–4 teachers. Kathy (Kindergarten teacher and CMIT Facilitator) referred to the Kindergarten mathematics program showing how sequences of lessons were aligned to both the *Framework* and the *Mathematics K–6* (Board of Studies NSW, 2002). Individual lessons were directed towards the progression of more sophisticated arithmetical strategies and frequent reference was made to relevant support materials such as *Developing Efficient Numeracy Strategies* (NSW DET, 1999). Additionally, the School Management Plan with its budgetary allowances for CMIT resources and staff training provided explicit evidence that the maintenance and expansion of CMIT was a high priority for the school leadership team. A fact mentioned by two interviewees was the perception that "the school is really committed to the program, and you know that its here to stay" (Lilly, Year 3/4 teacher).

The *Framework* was perceived to be extremely influential in the instructional decision making of Kindergarten and Year 1 teachers interviewed. For some teachers, the LFIN was considered more "user friendly" than the syllabus because it provided more "detail" about specific strategies and a greater "sense of direction":

> We all have the *Framework* in Number on a table or up on the wall in the classroom as a constant reminder as to where you're taking these kids next. … you can see where they have been and where they have to go. (Ann, Kindergarten teacher)

21

During the interview teachers were asked to rate their understanding of the LFIN on a scale 0 to 4 (nil to excellent). Similarly, they were asked to rate the extent to which the LFIN increased their awareness of children's development in number and their confidence identifying individual children's stage of development on the LFIN. They were also asked to explain their ratings. Table 2 presents the results of teachers' ratings for School A. A discussion of their explanations follows.

Overall, teachers were reluctant to give themselves an 'Excellent' rating for their understanding of the LFIN. Two Year 3/4 teachers (Roberta and Kate) commented that with less than a years experience working with the *Framework*, they "still had a lot to learn". Mark thought that his understanding was currently a Level 2, but expected "given time, I will be able to delve into it more".

All teachers considered that their awareness of children's development in number had increased at Level 2 or above. Jane, a Year 5/6 teacher, introduced to CMIT only a few months earlier remarked that her awareness had "increased amazingly". Three of the teachers referred to the fact that it had been a "steep learning curve" and that they were still "on the journey". Except for Kate, a Year 3/4 teacher, all teachers rated their confidence using the LFIN to identify children's stage of development as a Level 2 or 3. Most teachers agreed with Jane that "I haven't done it enough to be sure" and Mark that "while I'm at least a Level 3 for confidence, I'm heading for a Level 4—I just need another year to consolidate what I've learnt". Kate also thought that another year implementing the program would ensure an increase in her confidence.

It will be recalled that Section 3 of the survey presented an excerpt from an interview in which a child's early arithmetical strategies were being assessed. Survey respondents were required to respond with advice regarding (a) the child's numerical development, and (b) what to teach the child. Due to the enormous variation in responses to this item, a rubric was established to assist with analysis of respondents' comments. The final component of the interview aimed to elicit explicit information about the LFIN to supplement and help verify information obtained in this section of the survey. It did this by asking interviewees to provide authentic examples (their own students) of how they utilise the LFIN to assess students' mathematical development and plan for appropriate instruction. During the interview, teachers were asked to discuss specific students' stages of development in relation to mathematics content currently or recently studied in class. They were also asked to elaborate on the types of teaching and learning experiences they provided for these students to help them progress to the next stage of strategy development according to the LFIN. Interviewees were informed that they could refer to support materials such as programming documentation or CMIT-related resources to assist their response, but all indicated that this was not necessary
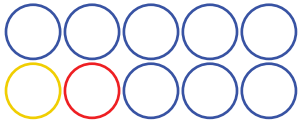
because it related to programming and teaching that was familiar to them. To assist the presentation of these data and their analyses, the rubric used to analyse Section 3 survey responses was employed. Each interviewee's ability to articulate particular students' strategy development and elaborate on appropriate learning experiences for them were categorised according to the rubric. The categorisation levels were then compared to the results of Section 3 on the survey for the relevant school. Table 3 presents the results of the categorisation process for teachers from School A and provides sample responses for each category on the rubric to assist with validation of the categorisation process. As with the interpretation of data from the survey, an allocation to a particular level on the rubric does not indicate that one teacher is considered a better teacher than any other. Rather, they are considered to have a different level of understanding of the LFIN as could be interpreted from their responses during the interview, or they are perhaps less or more likely to utilise the LFIN to guide their instructional decision-making than another teacher.

Unlike the comparable Section 3 of the survey, where the same rubric was used to analyse respondents' interpretations of a hypothetical student's strategy development, no interviewee was considered to have provided a Level 0 response. Overall, interviewees provided quite lengthy and more detailed descriptions about the strategy development of individual and small groups of children from their classes than was provided by survey respondents for the hypothetical student. Two interviewee responses were categorised as Level 1, meaning that they were quite comfortable describing the strategies particular students displayed but generally could not articulate a clear or appropriate direction that strategy development should take to help the child advance. Given that the majority of interviewees at School A had only about one year (or less) experience implementing CMIT, it is encouraging that five out of seven interviewees provided responses that were considered to be a Level 2 or higher response to this set of interview questions.

Four of the interviewees' responses were considered to be at Level 3. In particular, this group of teachers were able to clearly articulate appropriate instructional decisions they had made to enhance the strategy development of particular students.
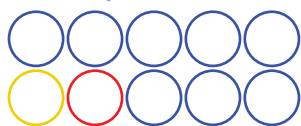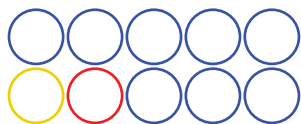
NEALS

Table 3. Categorisation of School A interviewees' abilities to articulate use of the LFIN to assess students' strategy use and plan appropriate instruction

Level	Number of Interviewees responding at each level N = 8	Number of survey respondents at each level N = 10	Description of response level	Sample responses for each category
0	0	2	No response, unreasonable or inappropriate response indicating little/ no understanding of task or unable to make sense of response.	N/A
1	2	3	Strategy development described or LFIN referred to but inappropriate stage selected or rationale for selection unclear. No follow-up suggested or some understanding evident of follow-up activities but may not be the most appropriate given stage selected.	These kids can add and subtract 2-digit by 2-digit numbers mentally without the number line. They use splitting and combining strategies. Some take a lot of time but do it mentally. I don't think they are just visualising the algorithm.
2	4	3	Appropriate strategy described or LFIN referred to. Follow-up learning experiences mostly appropriate.	She is low on the LFIN. When I covered the counters she couldn't do the tasks. She's very visual. So I give her addition tasks with 'dot' dice. I'm trying to get her to count-on from the number without counting all the dots.

NEALS

| 3 | 2 | 2 | Comprehensive understanding of strategy development LFIN and/or uses LFIN to justify choice of appropriate follow-up learning experiences. | My weakest are still Emergent. They can't recognise all the numbers or even count to 10 yet. So we are working on number recognition and counting forwards and backwards to 10. I'm encouraging them to add two groups of counters together. A few are just starting to work at the Perceptual stage. |

Given the overall success of interviewees responding to this component of the interview, evident by the degree of detail provided and the amount of coherence between teachers' interpretations of students' strategy development and their recommended follow-up for instruction, it is clear that more useful information about the ability of teachers to articulate their knowledge of the *Framework* is gained from an interview context. This is no doubt influenced by the fact that, during an interview, teachers can refer to their own students and authentic examples of their own instructional decision-making.

SCHOOL B

Seven teachers from School B were interviewed, including two Year 1 teachers, a Year 2 teacher (CMIT Facilitator), a composite Year 1/2 teacher, a Year 3, 4/5 and a 5/6 teacher. As mentioned earlier, staff at School B had more experience implementing CMIT than either of the other two schools, ranging between 5 months to 8 years—the majority of teachers interviewed had 4 or more years experience implementing CMIT in their classrooms.
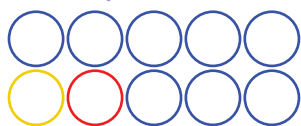
Table 4. *Summary of background information for interviewees at School B and their self-ratings for their understanding and confidence using the LFIN*
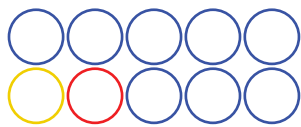
Interviewee	Grade	Approx. Months/Yr using CMIT	Self-rating for Understanding of LFIN (0 to 4)	Self-rating for extent LFIN increased awareness of number development	Self-rating for Confidence using LFIN (0 to 4)
1. Alyson	3	6 years	3	4	3
2. Naomi	1	5 months	2	3	1
3. Tania	1 & 2	8 years	3	4	3
4. Mandy*	2	4 years	3	4	3
5. Maxine	4 & 5	6 years	1	4	3
6. Katie **	5 & 6	5 years	3	4	4
7. Narelle	1	<1 year	1	2	3

* CMT Facilitator ** Counting On Facilitator

Unlike staff at School A, who received their training in Stage teams, staff at School B mostly received their introductory training individually or in pairs from other teachers at the school and with the occasional assistance of an externally-based mathematics consultant who visited their school to provide specific advice regarding the implementation of CMIT. This training arrangement was due to the fact that CMIT had been initially introduced to the school 8 years ago, and the steady stream of new staff (all being early career teachers) had to be inducted to CMIT on an individual or small group scale since that time. The majority of interviewees felt that "the introduction to CMIT early in my career" or at a point when "I changed to a different grade", meant that it had a greater impact on the way they taught mathematics. Naomi, a Year 1 teacher with only 3 years teaching experience recalled:

> About halfway through the year, I asked if I could be mentored and (another teacher), who was confident with the program … came in for one day a week. It was myself, Narelle (Year 1 teacher) and another new grad … we were able to spend one day a week with her for a term—we were extremely fortunate. Initially she took the lessons and she would say this is what we're going to focus on and I want you to tell me what you think the kids are doing now and where do you want to move them to, what activities are you going to use. Then we evaluated the effectiveness of them. That was my first year of teaching!

Naomi considered this on-the-job training to have "changed my teaching" and "the way I program". Prior to her CMIT training, "I didn't see the *Framework* as vital to incorporate, but now I use it as a frame to build around". Similar to the views expressed by interviewees from School A, Naomi, along with three other interviewees from School
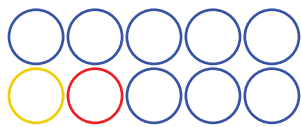
NEALS

B (Tania, Alyson and Narelle), considered that "I still have much to learn" about the LFIN. In particular, Naomi expressed the view that "I would have loved someone in my teacher training to have given me the background theory on the *Framework* and explain how it was created, why a child is emergent or perceptual—it would have been fantastic!".

Tania, currently a Year 1/2 teacher, was only in her first year of teaching when CMIT was first introduced in the school about 8 years ago. She commented on how the training and implementation of the program had changed since then and attributed a great deal of the positive changes to "our new principal and making maths a focus for the year". Tania also considered the training and development conducted at the whole-school level by the CMIT facilitator "to be very helpful. We have explicit training on how to use the *Framework*. We have formal whole school meetings about it, but we also consult each other in an informal way".

While little formal CMIT training was done at the stage-level at School B, teachers from the same stage collaborated to develop their teaching programs. Mandy, a Year 2 teacher and CMIT facilitator explained how she arranged for an external mathematics consultant to visit the school earlier in the year to help explicitly with programming. As a result, she now considered most K–4 teachers to have "CMIT activities embedded into the number programs—they are not seen as something separate". Evidence of this integration was found in the teachers' programs. While programs for each stage did not explicitly refer to strategy development named on the LFIN, the learning experiences and activities followed a sequential development akin to the knowledge, skill and strategy development outlined on the LFIN. Additionally, named activities and resources in the programs made direct reference to CMIT resources such as *The Developing Efficient Numeracy Strategies Books 1 and 2* (NSW DET, 1999; 2003). Mandy commented,

> The LFIN is the reason for the choice of activities. We use the results of the SENA testing to determine how we group the children initially and what activities go into the program—that's why I have the results of the SENA and my observations at the front of my program.

Programming and assessment seemed to be integral at School B. All seven interviewees commented on how they were moving away from a reliance on repeated use of SENA testing as a source of information about students' strategy development to more continuous assessment methods via classroom observations and record keeping. Naomi referred to "on the hop" assessment—"while they are doing an activity, I ask them a few questions and keep a record. Are they still only figurative or have they moved to Counting-on? I rather do this than a SENA again."

Another practice common to interviewees at School B, was the manner in which they structured their lessons to cater for varying abilities. In each case, interviewees generally preferred to use the same activity and adapt it to suit different ability levels. Tania explained how her current practice of teaching her composite Year 1/2 is quite different to what it was when she first started implementing the program eight years ago:
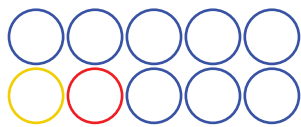
Now it is quite different. We explicitly teach concepts. I tell them why we are doing the lesson and the outcome I am focussing on and what I expect by the end of the lesson. I use the same activity but I make adaptations to suit their different learning levels. The perceptual kids may get dice with dots but the figurative ones will have dice with numbers and my brightest may have to use three, four or five dice.

Similarly, Alyson, a Year 3 teacher who had been implementing CMIT for 6 years in the classroom, noted that she now felt very comfortable modifying activities—"using the same concept, but changing the numbers", to cater for the different abilities in her class. She considered this aspect of CMIT to be a strength of the program and attributed her growing understanding of children's strategy development to her constant referral to support documents such as "the DENS 2 book and the *Framework*".

Table 4 presents the results when interviewees from School B were asked to rate their understanding of the LFIN, the extent to which the LFIN increased their awareness of children's development in number and their confidence identifying individual children's stage of development. Overall, interviewees rated themselves very positively on the three aspects. In particular, all but two interviewees rated themselves at the highest level in terms of the extent to which the LFIN had impacted on their awareness of children's development in number. Narelle, a Year 1 teacher who had been implementing CMIT for approximately one year, explained her confidence in using the LFIN had grown enormously since she had used it to assess a second group of students. In line with other interviewees from her own school and those from School A, she only rated her understanding of the LFIN a Level 1 because she felt "there is so much more to learn about it—and I'm learning new things all the time".

Additionally, Narelle and Naomi commented that while they were quite confident with their knowledge about the LFIN and their ability to use it for the grade and stage they were currently teaching, they were not so confident for students in other grades. Naomi was reluctant to rate herself more highly than Level 2 for her understanding of the LFIN and a Level 1 for her confidence using it to assess students because "I still have to come to this document (the Framework) to find out how to move them". This low self-rating was in contradiction to the fact that she was easily able to suggest modifications to activities to

28

NEALS

suit varying abilities of students without having to refer to support documents later in the interview. A possible reason for this apparent contradiction is that Naomi rated herself in terms of 'future' use of the LFIN and was therefore unsure of where a new group of students would take her. However, having used the LFIN in her planning, she was very comfortable relating the instructional decisions she had already made.
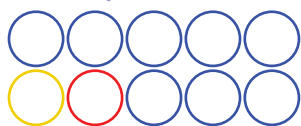
Katie, a Year 5/6 teacher with five years teaching experience, had been introduced to CMIT in her first year of teaching while working on a Stage 2 class. She had now spent four years teaching Stage 3 students and was the Facilitator for the Counting On program. While she had been implementing Counting On for a number of years, Katie felt that the biggest improvement to her understanding of the *Framework* "came only this year when I went to the Facilitator training. Prior to this I was probably only a Level 1 but now, I'd say my understanding is around Level 3". She felt that there was "a real need for Counting On in this school" with so many students from low socio-economic backgrounds and so many coming from other schools who had not experienced CMIT in earlier stages. Katie explained why she considered it more difficult for teachers of Years 2 to 6 to use the *Framework* and implement CMIT:

> You need to know a lot more of the levels and how to differentiate the levels. As kids get older, there are more concepts you need to test like multiplication, division and then fractions. There's more 'bits' of information that need to be filled in for those having trouble—it gets messier as they get older. It's better to sort them out when they're younger.

Similar to a comment made by Mandy, the CMIT Facilitator for K–4, Katie thought that the whole staff would benefit from the Facilitator training she received to boost their understanding of the *Framework*. While she had been implementing Counting On for a number of years and was comfortable with the practical applications of the LFIN, she thought all teachers should "know the background theory first to know how to follow through and know why the activity is chosen". This desire to learn more about the 'theory' behind the *Framework* was expressed by three other interviewees from School B, including Mandy, Alyson and Tania, and indicates their readiness to move to another, more sophisticated, level of operation with the LFIN.

The final component of the interview aimed to elicit explicit information about the LFIN in an attempt to verify teachers' self-ratings about their abilities to utilise the *Framework* to identify students' strategy development and plan appropriate instruction. It was also used to help verify information obtained in Section 3 of the survey through examples of students in their own classes. Interviewees were asked
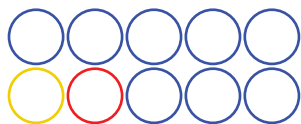
to discuss specific students' stages of development in relation to mathematics content currently or recently studied in class. They were also asked to elaborate on the types of teaching and learning experiences they provided for these students to help them progress to the next stage of strategy development according to the LFIN. As was the case for School A, all interviewees responded to this component of the interview without referring to any form of support documentation—an indication that they were familiar with the type of activity and confident with their abilities to respond appropriately.

As previously described for School A, interviewees' responses to this component of the interview were categorised into one of four levels according to a rubric established to assist the analysis. Table 5 presents the results of this categorisation process for both the interview and the comparable Section 3 of the survey.
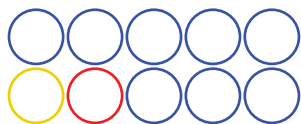
Table 5. Categorisation of School B interviewees' abilities to articulate use of the LFIN to assess students' strategy use and plan appropriate instruction

Level	Number of Interviewees responding at each level N = 7	Number of survey respondents at each level N = 7	Description of response level	Sample responses for each category
0	0	0	No response, unreasonable or inappropriate response indicating little/ no understanding of task or unable to make sense of response.	N/A
I	0	2	Strategy development described or LFIN referred to but inappropriate stage selected or rationale for selection unclear. No follow-up suggested or some understanding evident of follow-up activities but may not be the most appropriate given stage selected.	N/A

2	3	1	Appropriate strategy described or LFIN referred to. Follow-up learning experiences mostly appropriate.	For multiplication, my lowest child can really only manipulate concrete materials. Now he can count by 3s but still needs counters. My top kids automatically know that multiplication and division are completely related. They are just starting to work with remainders. The 'Froggy' game is fantastic for them.
3	4	4	Comprehensive understanding of strategy development LFIN and/or uses LFIN to justify choice of appropriate follow-up learning experiences.	This child is Facile because he knows that 5+9 is 14 is the inverse of 14-9 = 5. He is good at combining numbers and can use different strategies depending on the questions eg. For 54 plus 19 he will round to 20 and compensate. He's been using the number line but I'm getting him to do it all mentally now.

Similar to Section 3 of the survey, School B interviewees' abilities to clearly articulate the arithmetical strategy development of their students as detailed by the LFIN and provide comprehensive justifications for their instructional decision making were, overall, rated quite highly. All seven interviewees were considered to have provided a response at Level 2 or 3 on the rubric—an indication of their extensive experience implementing CMIT. As with School A results

NEALS

for this component, interviewees from School B were considered to demonstrate a higher level response on the rubric than they did on the comparable, hypothetical, section of the survey. A comment by Maxine, a Year 4/5 teacher with 6 years experience implementing CMIT, provides a possible explanation for the ability of teachers to provide more comprehensive responses during an interview situation; namely, the familiarity they have with their own students:

> These are my students I'm talking about—it shouldn't be hard for me to know what they can and can't do by now. I often sit with the kids and become more and more familiar with them, what they can or can't do. I just sit there and watch them. I find that I notice each of them and I keep a record of what I notice.
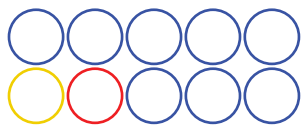
SCHOOL C

Seven teachers from School C were interviewed, including three Kindergarten teachers, a composite Kindergarten/Year 1 teacher, a composite Year 1/2 teacher, one teacher each from Years 1, 2 and 3. The background information for each interviewee, including the number of years they have been implementing CMIT and their self-ratings, is summarised in Table 6.

CMIT was first introduced to the school approximately ten years ago. However, Christine, a Year 3 teacher who was on staff at the time, recalled that "there wasn't really a focus to follow it up. There was no understanding of the *Framework* so it didn't really become part of school practice". Given the turn-over of teaching staff in the past ten years, the majority of whom arrived as new graduates, staff at the school trained in CMIT once again approximately two years ago. Hence, four of the seven interviewees received their CMIT training at that point with two new teachers (Erica and Natalie) only being inducted into the program in the past five months via other stage team members and Robyn, the school's CMIT Facilitator.

Table 6. Summary of background information for interviewees at School C and their self-ratings for their understanding and confidence using the LFIN

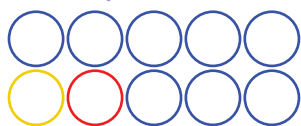| Interviewee	Grade	Approx. Months/ Yr using CMIT	Self-rating for Understanding of LFIN (0 to 4)	Self-rating for extent LFIN increased awareness of number development	Self-rating for Confidence using LFIN (0 to 4)
1. Robyn*	2	2 years	3	4	3
2. Vera	K	2 years	3	3	3
3. Violet	K	2 years	2	2	2
4. Kristen	1 & 2	2 years	1	2	1
5. Erica	1	5 months	2	3	3
6. Natalie	K & 1	5 months	3	3	4
7. Christine	3	10 years	3	4	3

* CMIT Facilitator

NEALS

Targets and objectives for CMIT with associated funding commitments, particularly to cater for new resources and the induction of new staff, were contained in the school management plan. The management plan, along with the CMIT action plan, indicated a focus on consolidating the program in the K–2 classes and establishing it in Years 3 and 4. In accordance with this strategy, interviewees teaching K–2 all referred to the collaborative manner in which teachers shared ideas and developed their programs within stage teams. Kristen, a Year 1/2 teacher, commented that among the infant teachers it is "a collegial effort, asking for help if you need it. It is like guided reading, but it is 'guided' CMIT". In relation to programming, it was considered that "in infants we are on the same page, we all like to use CMIT and we all program for it in similar ways." Vera explained how all the Kindergarten teachers "got together and go through the documents—the syllabus, DENS and the *Framework*—and see where we want to go. But we still plan individual lessons separately because our children are at different stages".

Kindergarten teachers, Violet and Vera presented their written programs to exemplify the explicit links contained in it to the LFIN. Violet explained that the "proforma" was used throughout the infant classes to provide some consistency within stages and that the *Framework* was used to "gear activities to specific groups of students". Each page of the program represented one week of mathematics instruction (five lessons—four planned and a 'gap' lesson to cater for unexpected interruptions or to provide extra support and revision if needed). In addition to syllabus outcomes, specified content and processes, explicit reference to aspects of the *Framework* were listed for the focus of each lesson and accompanied by lists of activities intended for varying student ability levels as indicated on the LFIN. Violet confirmed that this was a recent "slight change to the way we program" to accommodate "where the children are at".

Kristen explained how she and Robyn also recently changed the way they program and implement each lesson:

> We look over what our key idea for the lesson is, always doing a whole group activity and then moving into 3 different CMIT groups within our classrooms of different levels …. we then went through and selected the CMIT activities we thought best suited what we were doing for that day or week and looked at the different levels of those activities. Originally we weren't doing that, we were saying one activity at a time and I didn't feel like I was addressing all of the students at all different levels. It took a lot longer to program but we decided to be more explicit so we actually felt like we were using the *Framework* effectively.
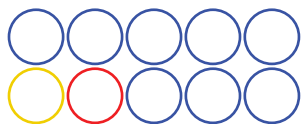
Grouping of students for instruction according to their SENA results

33

NEALS

was commonly described as part of regular teaching practices by all interviewees. However, Christine (Year 3 teacher) explained that it was still not common practice among the rest of Year 3 and 4 teachers, so she was not able to explicitly refer to the *Framework* in the stage-developed program since not all teachers were comfortable with the terminology. Christine was aware that K–2 teachers now tracked student progression on the LFIN via the SENA and their observational records throughout the year and she believed that these continuous assessment records would be passed to her in future years. It was a practice she considered necessary to continue up through all the grades but realised that she needed to have more Year 3 to 6 teachers "familiar with the *Framework* and SENA" to achieve this.

Table 6 presents the results when interviewees from School C were asked to rate their understanding of the LFIN, the extent to which the LFIN increased their awareness of children's development in number and their confidence identifying individual children's stage of development. Overall, interviewees rated themselves quite positively, with each one emphasising that they still "turned to the *Framework* or DENS book" to confirm their judgements about individual children's stage of strategy development and the types of activities needed to help them progress. Kristen rated herself more conservatively than other interviewees, only rating her understanding of the *Framework* as a Level 1. She explained "SENA 1 is easy for me because I've done it lots, but SENA 2 is new territory for me this year and I'm not sure if I'm pushing them enough". The 'new territory' of SENA 2 and the aspects of the LFIN that she had not dealt with in previous years were also reasons why she rated her confidence in using it to identify students' stages of development only as Level 1. Both Kristen and Violet considered the LFIN increased their awareness of strategy development at about a Level 2, while all other interviewees rated this item a Level 3 or 4. Despite this relatively low rating, they described the increase in awareness of children's strategy development as "quite considerable". Violet added that she felt "like I'm still learning about how to use the *Framework* in my program, and that's why I still fit down here". As was the case for many interviewees at Schools A and B, the perception that there is still much more to learn about the *Framework* and how to use it to guide instruction seems to weigh heavily on teachers' minds—resulting in conservative self-assessments of their knowledge about the LFIN and their interpretation of its use.

At the other end of the self-assessment spectrum, both Robyn and Christine rated their increase in awareness of children's strategy development at the highest level (Level 4). With 16 years teaching experience, Christine found that the LFIN "explained things about why children can and can't do things" that she had not known before and therefore had been provided with new insights into the mathematical development of children. Robyn, on the other hand, felt that "the syllabus
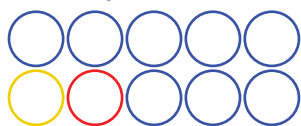
doesn't have the clear continuum of stages like the *Framework*. The *Framework* tells you exactly where they have to go next". Hence, the more explicit information about strategy development made it easier for her to plan instruction to assist the progression of each child.

Interviewees were asked to discuss specific students' stages of development in relation to mathematics content currently or recently studied in class as part of the final component of the interview. They were also asked to elaborate on the types of teaching and learning experiences they provided for these students to help them progress to the next stage of strategy development according to the LFIN. As was the case for both School A and B, all interviewees responded to this component of the interview without referring to any form of support documentation. Table 7 presents the results of the categorisation process for both the interview and the comparable Section 3 of the survey for School C participants.

Table 7. Categorisation of School C interviewees' abilities to articulate use of the LFIN to assess students' strategy use and plan appropriate instruction

Level	Number of Interviewees responding at each level N= 7	Number of survey respondents at each level N= 10	Description of response level	Sample responses for each category
0	0	3	No response, unreasonable or inappropriate response indicating little/no understanding of task or unable to make sense of response.	N/A

I	0	3	Strategy development described or LFIN referred to but inappropriate stage selected or rationale for selection unclear. No follow-up suggested or some understanding evident of follow-up activities but may not be the most appropriate given stage selected.	N/A
2	5	3	Appropriate strategy described or LFIN referred to. Follow-up learning experiences mostly appropriate.	In my lower group I have some children who are confidently starting to count on in their heads. I have one who is still counting every number because they can't count on. I'm using 10 frames and working on counting on. Some still can't recognise the pattern for 5 instantly. I'm working on their ability to instantly recognise their patterns at least to 5.
3	2	1	Comprehensive understanding of strategy development LFIN and/or uses LFIN to justify choice of appropriate follow-up learning experiences.	My lowest would be figurative. They rely on going back to count from one. They don't have the confidence to count on from the larger number so we've been working on identifying the higher number and counting on by 2 or 3. Many now have counting on strategies.

Following the trend set by interviewees from both School A and B, interviewees' responses from School C were rated quite highly and more positively than the comparable section from the survey. Five out
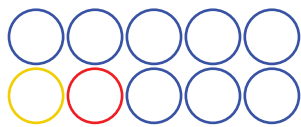
NEALS
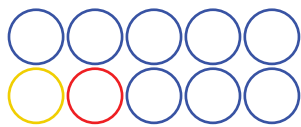
of the seven interviewees provided responses categorised at Level 2, meaning that they could clearly articulate the arithmetical strategy development of their students as detailed by the LFIN and provide comprehensive justifications for their instructional decision-making. This is a pleasing result, given that the majority of interviewees (six out of seven) had only two years or less experience implementing CMIT in their classrooms.
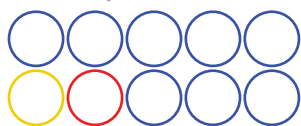
SUMMARY OF RESULTS AND RECOMMENDATIONS

The aim of this study was to explore teacher knowledge of the *Learning Framework In Number* (LFIN) from the *Count Me In Too* numeracy program and the impact this knowledge has on their pedagogy. This section summarises the main findings in terms of the research questions and makes recommendations for the CMIT program.

1. WHAT ARE TEACHERS' PERCEPTIONS ABOUT THE DEGREE TO WHICH CMIT IS BEING IMPLEMENTED AT THE SCHOOL AND CLASSROOM LEVELS?

Information concerning teachers' perceptions about the degree to which CMIT is implemented at their schools and in their classrooms was gathered initially via the survey and then supplemented by interview data. The CMIT planning matrix (Appendix B) was used in the survey to allow teachers to self-rate themselves and their school according to the group of descriptors they felt best described the way CMIT operated on four aspects—Whole School Management, Teaching Practice, Assessment Practices and the Parent and Community Focus. Survey responses from all three schools consistently indicated that within each school, there was minimal involvement (Level 4 Descriptors) of parents with limited information about how the program operates being disseminated to the community. This aspect of the program was not targeted for follow-up at the interview stage of the current study so reasons for this perception cannot be elaborated upon. However, it is a potential area for study in future evaluations of the program.

Survey respondents particularly from Schools A and C generally perceived that CMIT was operating at the Whole School Management level, Teaching Practice and the Assessment Practice aspects at a level consistent with Group 2 or 3 Descriptors from the matrix. From the interview data, it was found that variation in this perception occurred across grade and stage levels—with Kindergarten and Year 1 teachers the most convinced that CMIT was operating in quite a robust manner in their classrooms and the classrooms of teachers from the same stage. This more positive perception is possibly due to the fact that in most cases, CMIT had been operating slightly longer in the infant classes than in the higher grades, therefore it was more established in terms of consistency in programming and the development of resources. Variation in perceptions was also related to the amount of experience an individual teacher or Stage team had implementing the program. In the case of School A, where teachers undertook CMIT training in Stage teams (subsequently redesigning aspects of their programming and the way they structured their classrooms for instruction collaboratively) there was a more consistent view as to the degree to which CMIT was operating. Additionally, the practice at School A of conducting classroom visits between the different grades increased individual teachers' awareness of other teachers' pedagogy in mathematics.

NEALS

Overall, a more robust implementation of CMIT and an explicit use of the LFIN were more evident at School B than for either of the other schools. For example, more than half of School B survey respondents considered Assessment to be best described by Group 1 or 2 Descriptors on the CMIT planning matrix. This means that the majority of respondents perceived there to be an understanding by teachers at their school of the LFIN and that flexible use of the SENA guided their assessment of students and informed their instructional practices. Consistent with survey findings, interviews confirmed that whole school professional development focusing explicitly on the LFIN occurred at School B and that there was an emphasis on integrating the *Framework* into teaching programs.

RECOMMENDATION 1.1

Count Me In Too Facilitators should focus on developing a deeper and shared understanding of the *Learning Framework In Number* among all staff through whole school professional development.

RECOMMENDATION 1.2

To enhance consistency in programming, that also includes a focus on the Framework to guide instruction, school administrators should encourage collaborate programming at the Stage level.

2. WHAT ARE TEACHERS' PERCEPTIONS ABOUT THE EXTENT OF THEIR KNOWLEDGE OF THE *LEARNING FRAMEWORK IN NUMBER*?

Information about the extent to which teachers considered they understood the LFIN and the extent to which they considered it to have increased their awareness of children's development in number was gathered by the survey and during the interview. In both instances, teachers were asked to self-rate their perceptions on a scale from 0 to 4 (nil to excellent). Data from both the survey and the interviews revealed that the majority of teachers from each school agreed that knowledge of the LFIN had significantly increased their awareness of children's mathematical develop in number—with 17 out of 28 (60.7%) survey respondents and 17 out of a total 22 (77.2%) interviewees rating the extent of its impact at the top two levels. However, both survey respondents and interviewees were reluctant to rate their understanding at the highest (excellent) level, despite evidence obtained during the interviews indicating that a total of eight teachers could comprehensively interpret student strategy development and clearly articulate appropriate instruction in terms of the LFIN at Level 4 (excellent). Only one survey respondent from each of the schools self-rated their understanding as excellent, but no interviewees did so. Interviewees' explanations of their ratings revealed that while many teachers felt they had learnt a great deal about the LFIN, their increased awareness had made them realise that they still had much more to learn about the *Framework* and how to
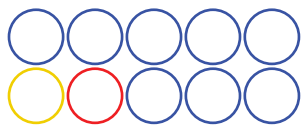
NEALS

use it to guide their instruction. This perception generally resulted in conservative self-assessments of their understanding of the LFIN and their interpretation of its use. In particular, teachers from each of the schools remarked that while they may have felt very confident about their understanding of the LFIN and its implications for their programming when working with a particular group or stage of children, a recent shift in the grade they taught meant that they now had to broaden their understanding to include new aspects of the Framework. In such cases, teachers remarked that they required more time to build the same level of familiarity with the LFIN.

At the other end of the spectrum, interviewees who rated their understanding of the LFIN at only Level 1 or 2, often did so because they felt their need to refer to another staff member or support documentation to either verify students' placement on the LFIN or the type of activities needed for a particular student, was indicative of a 'lower' level of understanding. An aspect of the CMIT program to be encouraged, is the degree to which professional conversations about the LFIN and associated learning experiences for students can assist within-school consistency and validity of teacher judgements. Additionally, such conversations have the potential to strengthen staff collaboration and continue to increase the professional knowledge of teachers. Hence, it is important that teachers do not shy away from seeking advice from other sources for fear that they may be considered to possess inadequate knowledge of the LFIN.

At School B, where the majority of interviewees had implemented CMIT for a number of years, four teachers expressed the desire to learn more about the 'theory' behind the Framework. This indicates their readiness to move to a more sophisticated level of operation with the LFIN. However, it also poses a potential problem regarding where and how these teachers might access this level of information. A possible solution for the future might lie in pre-service teacher education programs and their ability to include relevant theory as background in their mathematics education methods courses. As revealed by the current study, only one interviewee from each case study school had received any substantial introduction to the LFIN or an equivalent theoretical framework of children's arithmetical development during their initial teacher education. While a theoretical background by itself is insufficient for effective classroom implementation of such frameworks of learning, this information could at least provide the foundations of understanding upon which school-based professional development programs might build upon more easily.

A trend across all three case study schools was the link between the length of time that teachers had been involved with the implementation of CMIT and their self-identified level of understanding of the LFIN. In each case, the more time a teacher indicated they had been involved in the program, the more highly they tended to rate their understanding

and level of confidence using it to plan for instruction. However, 'time' by itself was not the definitive factor for improving teachers' abilities to understand and integrate the LFIN into their pedagogy. Instead, it was shown that each of the schools had implemented strategies over this time to embed the LFIN more seamlessly into their programming and teaching. At School B, whole school professional development with an explicit focus on understanding the *Framework* was undertaken, at School A the *Framework* was prominently displayed in infant classrooms to guide instructional decision-making, and at School C, it was highlighted in teaching programs so as to inform the learning experiences provided to students.

RECOMMENDATION 2.1

Regular conversations focussing on the identification of students' strategy development, the *Framework* and appropriate learning experiences should be encouraged at the whole school and stage or grade levels to assist teachers validate their decision making and develop consistency in their judgements.

RECOMMENDATION 2.2

While initial and on-going professional development in CMIT and the LFIN is currently provided future development involving the LFIN should accommodate the needs of some teachers to delve deeper into the theory behind it.

RECOMMENDATION 2.3

Teacher education programs should incorporate theoretical frameworks detailing children's cognitive development of mathematics into their pre-service early childhood and primary mathematics methods courses.

3. DO TEACHERS PERCEIVE THAT THE *LEARNING FRAMEWORK IN NUMBER* HAS IMPACTED ON TEACHING PRACTICES AT THE SCHOOL, CLASSROOM AND STUDENT LEVELS? IF SO, HOW? IF NOT, WHY?

Teachers' perceptions about the extent to which the *Framework* impacted on their teaching practices were obtained via Section 2 of the survey and from the interview. Additionally, verification of teacher perceptions was made possible through examination of the support documentation interviewees presented (school management plans and teaching programs) and when similar information was reported by a number of interviewees.

Survey respondents' perceptions as to the extent to which CMIT operated in their schools in terms of teaching and assessment practices varied slightly from school to school. While the majority of respondents from Schools A and C selected Group 2 or 3 Descriptors on the CMIT planning matrix for these aspects, respondents from School B tended to select Group 1 or 2 Descriptors. This means that the majority of respondents from School B considered themselves and
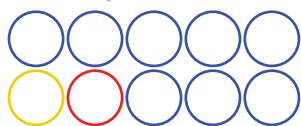
their colleagues to have a thorough understanding of the LFIN and that this knowledge was used by teachers to guide their assessment and instructional decision making in the classroom. The robust implementation of CMIT perceived to be operating at School B by survey respondents was consistently confirmed by other data. For instance, more survey respondents and interviewees from School B were able to clearly articulate how the LFIN could be used to assess students' strategy development and plan for appropriate instruction than from either of the other two schools.

Another recent change in practice that was noted by interviewees at Schools A and B was the perceived movement away from a reliance on repeated use of SENA testing as a source of information about students' strategy development to more continuous assessment methods via classroom observations and record keeping. This shift in practice is consistent with a more robust implementation of the CMIT program as described on the CMIT Planning Matrix.

Overall, participants considered the extent to which the LFIN influenced their personal instruction to be quite significant, with 17 out of 28 (60.7%) of survey respondents rating it at the top two levels. In particular, the Framework was perceived by interviewees at each school to be extremely influential in the instructional decision making of Kindergarten to Year 2 teachers more so than for teachers of other grades. As mentioned earlier, this was often perceived to be due to the extra time that CMIT had been operating in these grades as compared with that of other grades and the tendency for infant teachers to program collaboratively more often. For some teachers, the LFIN was considered more "user friendly", and therefore more influential, than the syllabus due to the detail about specific strategies and the sense of direction it provided for instruction of individual students.

In each of the case study schools, changes to the way teachers programmed, organised their students for instruction, and the way they taught their students were referred to by interviewees as a direct result of their CMIT training and their increased understanding of the LFIN. For instance, interviewees at each school made reference to strategies for differentiating tasks to suit the various abilities of their students. Teachers' programs sighted during interviews provided tangible evidence of such differentiation and indicated the extent to which CMIT activities had become embedded into the number programs at each school.

A number of interviewees expressed the view that an introduction to CMIT early in a teacher's career or at a point when a teacher experienced a shift to a different grade, meant that it was more likely to have a greater impact on the way they taught mathematics. These two points in a teacher's career were considered to be more

NEALS

influential when new information and teaching practices became firmly established as part of a teacher's routine practice. Importantly, those who wish to drive the professional development momentum at both the school and system levels should be aware and take advantage of these critical times in teachers' careers.

RECOMMENDATION 3.1

Schools should encourage their teachers to move away from a reliance on repeated use of SENA testing as a sole source of information about students' strategy development to more continuous assessment methods via classroom observations and record keeping.

RECOMMENDATION 3.2

Schools should take advantage of critical transitional points in teachers' careers when professional development is most sought and influential in establishing long-term and robust teaching practices.

4. HOW CONFIDENT DO TEACHERS FEEL ABOUT IDENTIFYING CHILDREN'S LEVELS OF MATHEMATICAL DEVELOPMENT ON THE LFIN?

Information about how confident teachers' felt using the LFIN to identify students' mathematical development and to plan for appropriate instruction was gathered by the survey and during the interviews. As discussed in relation to research question 2, there was a clear trend across all three schools linking the length of time a teacher had been utilising CMIT to their self-rated confidence level. That is, the more time teachers indicated that they had been implementing the program, the more confident they felt about their understanding of the LFIN and their ability to use it to guide their assessment and instructional decision-making. As discussed earlier, 'time' by itself was not considered the determining factor for a teacher's improved confidence level. Rather, the professional support at the school and, in particular, the stage-level, was considered more influential.
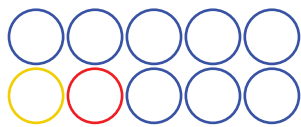
RECOMMENDATION 4.1

Schools should focus on building collaborative support mechanisms in their schools to assist teachers embed aspects of the LFIN in their programming. Such mechanisms should be particularly focussed at building coherent Stage level teams.

5. TO WHAT EXTENT IS THE CMIT PLANNING MATRIX A USEFUL TOOL FOR IDENTIFYING THE LEVEL OF REPORTED IMPLEMENTATION OF THE PROGRAM AT THE SCHOOL AND CLASSROOM LEVELS?

Survey respondents were required to use the CMIT planning matrix to rate the degree to which they perceived the program operated in their schools and classrooms in terms of four aspects—Whole School Management, Teaching Practice, Assessment Practices and the Parent and Community Focus. Overall, within-school ratings were
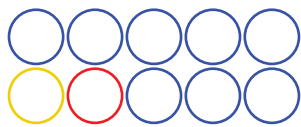
quite consistent for each aspect. In particular, every respondent from School A rated Parent and Community Focus at Level 4. Similarly, respondents from Schools B and C rated the same aspect at Level 3 or 4 Descriptors. It was also revealed that respondents from the same stage or grade level were more likely to rate aspects in a similar way with teachers of the higher grades tending to indicate that a less comprehensive or robust form of CMIT was being implemented at their schools than teachers from K–2 grades. Most importantly, survey respondent ratings were generally consistent with other data sources. For example, ratings by School B respondents indicated that there was a fairly robust implementation of CMIT for most aspects on the matrix at that particular school. This in fact was found to be the case. Interviewees described practices and provided documented evidence that 'Descriptors' from Level 1 and 2 of the matrix were indeed occurring at School B. In this case, the CMIT planning matrix proved to be a fairly accurate instrument for gauging the level of implementation of the program and has the potential to act as a guide to other schools wishing to enhance their involvement in the program.

Recommendation 5.1

Schools should use the CMIT planning matrix to monitor the degree to which CMIT operates in their schools according to all four aspects contained in the matrix. Such regular self-assessment will assist future development of the program, increase the professional dialogue surrounding the program and improve communication as to the consistency to which CMIT is operating at the whole school and classroom levels.

REFERENCES

Board of Studies, New South Wales (2002). *Mathematics K–6*, Sydney: Author.

Bobis, J., (1996). *Visualisation and the development of number sense with Kindergarten children*. In J. Mulligan and M. Mitchelmore (Eds.), *Children's Number Learning* (p. 17–33). Adelaide: Australian Association of Mathematics Teachers.

Bobis, J., Clarke, B., Clarke, D., Thomas, G., Wright, R., Young-Loveridge, J. & Gould, P. (2005). Supporting teachers in the development of young children's mathematical thinking: Three large scale cases. *Mathematics Education Research Journal*, 16, 27–57.

Cobb, P., Yackel, E., & Wood, T. (1992). Interaction and learning in mathematics classroom situations. *Educational Studies in Mathematics*, 23, 99–122.

Carpenter, T. P., Fennema, E., Franke, M. L., Levi, L. & Empson, S. B. (1999). *Children's Mathematics: Cognitively Guided Instruction*. Portsmouth: Heinemann and National Council of Teachers of Mathematics.

Gravemeijer, K. (1994). *Developing realistic mathematics education*. Utrecht, The Netherlands: CD-B Press.

Mulligan & Mitchelmore, (1997) Mulligan, J. T. & Mitchelmore, M. C. (1997). Young children's intuitive models of multiplication and division. *Journal for Research in Mathematics Education*, 28, 309–330.

New South Wales Department of Education and Training (2007). *Count Me In Too: Learning Framework In Number*, Sydney: New South Wales Department of Education and Training.

New South Wales Department of Education and Training (1999). *Developing Efficient Numeracy Strategies* Book 1, Sydney: New South Wales Department of Education and Training.

Swafford, J. O., Jones, G. A., & Thornton, C. A. (1997). Increased knowledge in geometry and instructional practice. *Journal for Research in Mathematics Education*, 28, 467–483.

Van den Heuvel-Panhuizen, M. (2001). *Children learn mathematics: A learning-teaching trajectory with intermediate attainment targets for calculation with whole numbers in primary school*. Utrecht: Freudenthal Institute, Utrecht University/SLO.

Wright, R. J. (1994). Working with teachers to advance the arithmetical knowledge of low-attaining 6- and 7-year-olds: First year results. In J. Ponte & J. Matos (Eds.), *Proceedings of the Eighteenth International Conference for the Psychology of Mathematics Education, Vol. 4*, (pp. 377–384). Lisbon, Portugal: PME.

Wright, R. J., Martland, J., & Stafford, A. (2006). *Early numeracy: Assessment for teaching and intervention*. London: Paul Chapman Publications/Sage.

NEALS

APPENDIX A

The University of Sydney

Faculty of Education & Social Work

Room 819 Bld A35
University of Sydney NSW 2006
AUSTRALIA
Telephone: +61 2 9351 4536
Facsimile: +61 2 9351 4580
Email: j.bobis@edfac.usyd.edu.au
Web: **www.usyd.edu.au/**

ABN 15 211 513 464

Associate Professor Janette Bobis
Associate Dean (Research)

PARTICIPANT INFORMATION STATEMENT

RESEARCH PROJECT

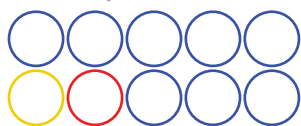Title: … The *Learning Framework In Number* and its impact on pedagogy

(1) WHAT IS THE STUDY ABOUT?

This study is concerned with teacher professional learning surrounding the *Learning Framework In Number from the Count Me In Too* [CMIT] numeracy project and teachers' perceived impact of this knowledge on teaching practices. The study will address the following questions:

I.   What are teachers' perceptions about the degree to which CMIT is being implemented at the school and classroom levels?

II. What are teachers' perceptions about the extent of their knowledge and the knowledge of other teachers of the *Learning Framework In Number* [LFIN]?

III. Do teachers perceive that the *Learning Framework In Number* has impacted on teaching practices at the school, classroom and student levels? If so, how? If not, why?

IV. How confident do teachers feel about identifying children's levels of mathematical development on the LFIN?

V.   To what extent is the CMIT planning matrix a useful tool for identifying the level of reported implementation of the program at the school and classroom levels?

(2) WHO IS CARRYING OUT THE STUDY?

The study is being conducted by Associate Professor Janette Bobis from The University of Sydney.

NEALS

(3) WHAT DOES THE STUDY INVOLVE?

The study includes 2 phases. Phase 1 involves the completion of a **survey** by as many willing K–4 teaching staff as possible, the CMIT Facilitator and executive staff (principal/deputy and/or assistant principals). The survey will seek contextual information about the school and the individual completing the survey. Section 2 of the survey will consist of 'descriptors' of various aspects of CMIT (including the LFIN) that are arranged according to four 'levels' of implementation. Teachers will be asked to rate the level they perceive best describes the implementation of CMIT at their school and in their own classroom. The third section of the survey will require an open-ended response to a scenario involving a description of a student's response to a mathematical task. Teachers will be asked to use the available evidence to approximate a child's performance as described by the LFIN and to make suggestions about the types of activities/learning experiences that would most suit the child's level of development. The survey will be completed anonymously at a time and place convenient to respondents. Participants will be asked to place completed surveys in unidentifiable envelopes that are to be sealed and returned to a central location (e.g., school office) for collection by the researcher approximately one week after the initial survey's distribution.

Phase 2 will involve **interviews** with as many K–4 teachers, the Facilitator and executive staff that are willing and deemed appropriate by the Principal. Staff will be individually interviewed on one occasion. The interviews will establish background biographical details before seeking information specifically related to professional learning and the implementation of CMIT and the LFIN. Teachers will be asked about their confidence concerning the identification of individual students' on the LFIN and the subsequent planning for student instruction. While the interviews will be audio-taped and later transcribed, all references to teachers' names and their schools will be substituted with an alias.

(4) HOW MUCH TIME WILL THE STUDY TAKE?

Time to complete the survey will take approximately 15-20 minutes. Time allocated to conduct interviews will be approximately 45 minutes. A relief teacher will be provided for the duration of the interviews with classroom teachers.

(5) CAN I WITHDRAW FROM THE STUDY?

Being in this study is completely voluntary and you are not under any obligation to consent to complete the survey. Submitting a completed survey is an indication of your consent to participate in the study. You can withdraw any time prior to submitting your completed survey. Once you have submitted your survey anonymously, your responses cannot be withdrawn.

If involved in the interview component of the study, you may stop the interview at any time if you do not wish to continue. Any information you may have given to the interviewer up to that point will be destroyed. Participants involved in the interview component will be asked to sign a consent form.

(6) WILL ANYONE ELSE KNOW THE RESULTS?

All aspects of the study, including results, will be strictly confidential and only the researcher will have access to information on participants. A report of the study will be submitted to the NSWDET and may also be submitted for publication, but individual participants or their schools will not be identifiable in such a report.

(7) WILL THE STUDY BENEFIT ME?

While unintentional, it is possible that by completing the survey and participating in the interviews, participants will become more aware of their existing but 'implicit' knowledge of the *Learning Framework In Number.* If so, they may be able to adjust their instructional strategies to better assist the mathematical development of children in their classes.

(8) CAN I TELL OTHER PEOPLE ABOUT THE STUDY?

You may tell other people about the study.

(9) WHAT IF I REQUIRE FURTHER INFORMATION?

When you have read this information, Janette Bobis will discuss it with you further and answer any questions you may have. If you would like to know more at any stage, please feel free to contact A/Professor Janette Bobis, 9351-4536 or **j.bobis@edfac.usyd.edu.au.**

(10) WHAT IF I HAVE A COMPLAINT OR CONCERNS?

Any person with concerns or complaints about the conduct of a research study can contact the Senior Ethics Officer, Ethics Administration, University of Sydney on (02) 9351 4811 (Telephone); (02) 9351 6706 (Facsimile) or **gbriody@usyd.edu.au** (Email).

This information sheet is for you to keep

NEALS

APPENDIX B
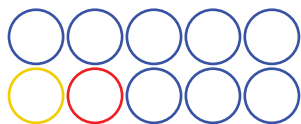
CMIT PLANNING MATRIX

This matrix is based on the assumption that the school has commenced implementation of the CMIT project.

Level	School management	Teaching practice	Assessment & monitoring of student progress	Parent and community focus
4	• Whole school team approach led by the CMIT coordinator with strong executive support. • Continuous cycle of review, evaluation, and implementation for CMIT. • School targets and long term goals for CMIT are funded and embedded within the school three year action plans. • All teachers, executive and support staff, are trained in CMIT to achieve syllabus outcomes, with provision for new staff. • Active involvement in local/ regional/ state networks. • CMIT is used to model, explore and promote quality teaching. • Teams meet regularly for professional learning and expertise within the school is valued and utilised to maximise the effectiveness of CMIT. • Professional learning leads to significant whole school improvements in teaching practice resulting in improved student learning outcomes.	• Students are provided with challenging tasks underpinned by the Working Mathematically processes which encourage substantive communication to develop deep understanding. • Professional reflection leads to classroom practice being constantly challenged and refined. • Flexible approach to classroom instruction and organisation of students. • All teachers have a thorough understanding of the LFIN to guide the teaching and learning cycle. • All teaching programs reflect a clear understanding of how CMIT is embedded within the syllabus. • Teachers adopt the NSW Quality Teaching model in their teaching of mathematics.	• Continuous assessment of students is used to inform teaching and learning. • A tracking system of student progress in mathematics is implemented throughout the school by all teachers to ensure continuity for all students. • Teachers are confident in making professional judgments regarding student achievement of syllabus outcomes and make appropriate improvements to teaching and learning.	• The school community is involved in and encouraged to support the development of mathematical programs within the school. • Parents are confident in supporting their children with mathematics at home. • Parents feel valued and there is a culture of collaboration between the community and the school. • Information is regularly provided to parents concerning all aspects of the mathematics program in the school.
3	• Stage team approach guided by the school CMIT coordinator with ongoing professional learning meetings. • Yearly review and evaluation of CMIT. • Yearly targets and funding set for CMIT. • Stage teams trained in implementing CMIT, with provision for new staff. • School CMIT coordinator participates in networks beyond the school. • School uses the NSW Quality Teaching model to improve teaching and learning in mathematics. • Professional learning is provided by the school CMIT coordinator with external support as needed. • Improvements in teaching and learning are evident after professional learning activities.	• Teachers meet to reflect on current teaching practice. • Students are provided with tasks at their instructional level, which encourages communication. • Groups reviewed regularly to ensure students' needs are addressed. • Teachers adapt activities to suit needs of all students. • Teaching programs reflect strong links between the LFIN and the syllabus. • Mathematics lessons are predominantly child centred rather than teacher centred.	• Teachers understanding of the LFIN and flexible use of the SENA guides assessment and grouping of students. • School process in place for tracking student progress. • Teachers incorporate some assessment for learning as well as assessment of learning in their planning and programming.	• Training is provided to assist parents as CMIT tutors in the classrooms. • Parent training focuses on strategies that specifically support student learning. • Workshops are provided for parents in understanding how mathematics knowledge and strategies develop and in how they can support their children's learning at home. • The school community is informed about mathematics programs.
2	• CMIT is supported and allocated funding within the school action plan for implementation across a year level. • CMIT facilitator is responsible for the organisation of resources. • CMIT is discussed at year meetings. • Professional learning about Quality Teaching is occurring in the school, although mathematics has not been a specific focus. • Professional learning in CMIT is provided by the CMIT facilitator and focuses upon the initial training of teachers and the assessment of students.	• SENA results and the LFIN used to form ability groups with limited opportunities for students to move between groups. • Teacher encourages students to explain strategies. • CMIT is used to program number. • Teaching practice strongly focussed on hands-on activities. • Teacher relies on a bank of resources to implement CMIT.	• SENA administered by the class teacher at the beginning and end of the year. • Student assessment of learning, based solely on the EAS results, is used to group students. • Student progress is monitored using the Student Analysis sheets.	• Parents assist in some class programs, usually supervising group work during number lessons. • Parents are informed about the CMIT program at a 'Meet the Teacher' session. • Parents are informed through presentations to parent organisations regarding the implementation of CMIT in the school.
1	• CMIT is not identified in the school action plan. • Some class teachers may implement aspects of CMIT, on an individual basis. • Individual teachers benefit from attending professional learning in mathematics with limited sharing of knowledge or impact upon the school. • Some individual teachers may use the Quality Teaching documents to evaluate aspects of their own teaching. • Professional learning is dependent on input from outside experts on a one-off basis.	• Teaching to the "middle" with some allowance for other students. • Emphasis is on accuracy and speed of student's response. • Teachers may include some aspects of CMIT in their current teaching practice. • There is limited understanding of how to match learning activities to the LFIN and the needs of the students. • CMIT is seen as additional to the regular class number program. • Textbooks determine the program and what is taught in mathematics.	• The SENA is administered to some classes, not necessarily by the class teacher. • Minimal interaction and sharing of information about student learning between teachers. • Individual teachers record the progress of students in their class for reporting purposes. • Strong reliance on traditional tests with results recorded on student record cards.	• Information about students is provided through written reports and during parent teacher interviews. • The parents may indicate they are not confident in supporting maths programs at school and home.
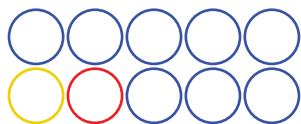
APPENDIX C

COUNT ME IN TOO EVALUATION 2008

Thank you for taking the time to complete this survey. This survey is to be completed by K–4 teachers involved in the implementation of CMIT, Facilitators and school executive (Principal and/or assistant/ deputy principal) in schools where the *Count Me In Too* program is operating. The aim of this survey is to explore your perceptions concerning the extent to which aspects of CMIT have impacted on school-level structures and practices, individual teacher professional knowledge and classroom teaching practices.

Being in this study is completely voluntary and you are not under any obligation to consent to complete the survey. Submitting a completed survey is an indication of your consent to participate in the study. You can withdraw any time prior to submitting your completed survey. Once you have submitted your survey, your responses cannot be withdrawn. All responses to this survey will be kept confidential. Please do not put your name anywhere on this form. Information received will be used solely for the purposes of evaluating CMIT and will have implications for the future development of this program.

Please place completed surveys in a sealed and unidentifiable envelope and return to the school office for collection by the researcher approximately one week after the survey's distribution.

Any person with concerns or complaints about the conduct of a research study can contact the Senior Ethics Officer, Ethics Administration, University of Sydney on (02) 9351 4811 (Telephone); (02) 9351 6706 (Facsimile) or **gbriody@usyd.edu.au** (Email).

Thank you for your cooperation.

SECTION 1

THE SCHOOL CONTEXT

Please provide the necessary information or place a tick (√) in the box which best describes you and your school.

1. The name of the Region your school resides in: _____
    _____

2. Approximate number of students in this school

    < 100 ☐ $_{21}$ 100-200 ☐ $_{22}$ 201-300 ☐ $_{23}$

    301-400 ☐ $_{24}$ 401-500 ☐ $_{25}$ 500 + ☐ $_{26}$

50

NEALS

3. Distinguishing features of this school. (Tick all that apply).

High % NESB ☐ 31   High % Aboriginal ☐ 32   Predominantly white anglo-saxon ☐ 33

Low socio-econ. ☐ 34   Middle socio-econ. ☐ 35   High socio-econ. ☐ 36

Other: _____

INDIVIDUAL RESPONDENT DETAILS

4. Your Age:

20-30 ☐ 41   30-40 ☐ 42   40-50 ☐ 43   50 + ☐ 44

5. Sex: Female ☐ 51   Male ☐ 52

6. Years of teaching experience (including this year).

1-5 ☐ 61   6-10 ☐ 62   11-15 ☐ 63
16-20 ☐ 64   21 + ☐ 65

7. Current Position (tick all that apply):

Classroom teacher ☐ 71   CMIT Facilitator ☐ 72   Principal ☐ 73
Executive staff ☐ 74   Other: _____

8. Approximately how long as CMIT been operating in your school? _____ years and _____ months

ONLY RESPONDENTS WHO ARE ALSO CLASSROOM TEACHERS NEED TO COMPLETE QUESTIONS 9 – 11.

9. What grade(s) are you currently teaching? _____

10. Approximately how many years experience do you have teaching this grade ? (including this year)

1-3 years ☐ 101   4-7years ☐ 102   8+ years ☐ 103

11. Approx. how long have you been implementing CMIT in your classroom? _____ years and _____ months

NEALS
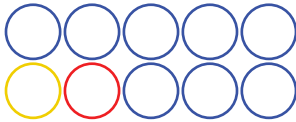
SECTION 2

This section contains "descriptors" of whole school, individual teacher/ classroom structures and practices with specific reference to various aspects of CMIT, such as the *Learning Framework In Number* (LFIN). The descriptors are grouped to provide a general indication of the extent to which CMIT is operating in a school community.

1. Please tick the group of descriptors that you consider **BEST** describes the way CMIT operates in your school at the **whole school management level**. (NB. Not ALL descriptors need to be present for you to select a group)

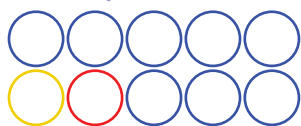| Descriptor Group 1 ☐	Descriptor Group 2 ☐	Descriptor Group 3 ☐	Descriptor Group 4 ☐
• Whole school team approach led by the CMIT coordinator or facilitator with strong executive support. • Continuous cycle of review, evaluation, and implementation for CMIT. • School targets and long term goals for CMIT are funded and embedded within the school three year action plans. • All teachers, executive and support staff, are trained in CMIT to achieve syllabus outcomes, with provision for new staff. • Active involvement in local/ regional/ state networks. • CMIT is used to model, explore and promote quality teaching. • Teams meet regularly for professional learning and expertise within the school is valued and utilised to maximise the effectiveness of CMIT. • Professional learning leads to significant whole school improvements in teaching practice resulting in improved student learning outcomes.	• Stage team approach guided by the school CMIT coordinator with ongoing professional learning meetings. • Yearly review and evaluation of CMIT. • Yearly targets and funding set for CMIT. • Stage teams trained in implementing CMIT, with provision for new staff. • School CMIT coordinator participates in networks beyond the school. • School uses the NSW Quality Teaching model to improve teaching and learning in mathematics. • Professional learning is provided by the school CMIT coordinator/ facilitator with external support as needed. • Improvements in teaching and learning are evident after professional learning activities.	• CMIT is supported and allocated funding within the school action plan for implementation across a year level. • CMIT facilitator is responsible for the organisation of resources. • CMIT is discussed at year meetings. • Professional learning about Quality Teaching is occurring in the school, although mathematics has not been a specific focus. • Professional learning in CMIT is provided by the CMIT facilitator and focuses upon the initial training of teachers and the assessment of students.	• CMIT is not identified in the school action plan. • Some class teachers may implement aspects of CMIT, on an individual basis. • Individual teachers benefit from attending professional learning in mathematics with limited sharing of knowledge or impact upon the school. • Some individual teachers may use the Quality Teaching documents to evaluate aspects of their own teaching. • Professional learning is dependent on input from outside experts on a one-off basis.
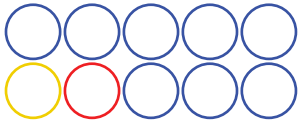
2. Please tick the group of 'Teaching Practice' descriptors that you consider BEST describes the way CMIT operates in your school at the classroom level.

Descriptor Group 1 ☐	Descriptor Group 2 ☐	Descriptor Group 3 ☐	Descriptor Group 4 ☐
• Students are provided with challenging tasks underpinned by the Working Mathematically processes that encourage substantive communication to develop deep understanding. • Professional reflection leads to classroom practice being constantly challenged and refined. • Flexible approach to classroom instruction and organisation of students. • All teachers have a thorough understanding of the LFIN to guide the teaching and learning cycle. • All teaching programs reflect a clear understanding of how CMIT is embedded within the syllabus. • Teachers adopt the NSW Quality Teaching model in their teaching of mathematics.	• Teachers meet to reflect on current teaching practice. • Students are provided with tasks at their instructional level, which encourages communication. • Groups reviewed regularly to ensure students' needs are addressed • Teachers adapt activities to suit needs of all students. • Teaching programs reflect strong links between the LFIN and the syllabus. • Mathematics lessons are predominantly child centred rather than teacher centred.	• SENA results and the LFIN used to form ability groups with limited opportunities for students to move between groups. • Teacher encourages students to explain strategies. • CMIT is used to program number. • Teaching practice strongly focussed on hands-on activities. • Teacher relies on a bank of resources to implement CMIT.	• Teaching to the "middle" with some allowance for other students. • Emphasis is on accuracy and speed of student's response. • Teachers may include some aspects of CMIT in their current teaching practice. • There is limited understanding of how to match learning activities to the LFIN and the needs of the students. • CMIT is seen as additional to the regular class number program. • Textbooks determine the program and what is taught in mathematics.

3. Please tick the group of 'Assessment' descriptors that you consider BEST describes the way CMIT operates in your school.

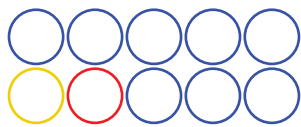| Descriptor Group 1 ☐	Descriptor Group 2 ☐	Descriptor Group 3 ☐	Descriptor Group 4 ☐
• Continuous assessment of students is used to inform teaching and learning. • A tracking system of student progress in mathematics is implemented throughout the school by all teachers to ensure continuity for all students. • Teachers are confident in making professional judgments regarding student achievement of syllabus outcomes and make appropriate improvements to teaching and learning.	• Teachers understanding of the LFIN and flexible use of the SENA guides assessment and grouping of students. • School process in place for tracking student progress. • Teachers incorporate some assessment for learning as well as assessment of learning in their planning and programming.	• SENA administered by the class teacher at the beginning and end of the year. • Student assessment of learning, based solely on the EAS results, is used to group students. • Student progress is monitored using the Student Analysis sheets.	• The SENA is administered to some classes, not necessarily by the class teacher. • Minimal interaction and sharing of information about student learning between teachers. • Individual teachers record the progress of students in their class for reporting purposes. • Strong reliance on traditional tests with results recorded on student record cards.

4. Please tick the group of **'Parent and Community Focus'** descriptors that you consider **BEST** describes the way CMIT operates in your school.

Descriptor Group 1 ☐	Descriptor Group 2 ☐	Descriptor Group 3 ☐	Descriptor Group 4 ☐
• The school community is involved in and encouraged to support the development of mathematical programs within the school. • Parents are confident in supporting their children with mathematics at home. • Parents feel valued and there is a culture of collaboration between the community and the school. • Information is regularly provided to parents concerning all aspects of the mathematics program in the school.	• Training is provided to assist parents as CMIT tutors in the classrooms. • Parent training focuses on strategies that specifically support student learning. • Workshops are provided for parents in understanding how mathematics knowledge and strategies develop and in how they can support their children's learning at home. • The school community is informed about mathematics programs.	• Parents assist in some class programs, usually supervising group work during number lessons. • Parents are informed about the CMIT program at a 'Meet the Teacher' session. • Parents are informed through presentations to parent organisations regarding the implementation of CMIT in the school.	• Information about students is provided through written reports and during parent teacher interviews. • The parents may indicate they are not confident in supporting maths programs at school and home.

	Nil	Minimal	Adequate/ Medium	Good	Excellent/ Extensively
5. Please rate your personal understanding of the *Learning Framework In Number* (LFIN).	☐	☐	☐	☐	☐
6. To what extent has the LFIN increased your awareness of children's development of number knowledge and arithmetical strategies?	☐	☐	☐	☐	☐
7. Please rate how *confident* you feel in identifying the stage of development of individual children on the LFIN.	☐	☐	☐	☐	☐
8. To what extent do you feel that the LFIN impacts upon the instructional decisions you make for individuals and groups of students in your class?	☐	☐	☐	☐	☐

Please turn over and complete Section 3

54

NEALS

SECTION 3: SCENARIOS

1. The following transcript is taken from a video of an assessment interview with a child.

Teacher: (Placing eight red counters and five blue counters in front of the child). How many counters are there altogether?

Child: (Counting by ones as he points to each counter) 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13 —thirteen.

Teacher: Here are four counters (shows counters to child then covers them) and here are three counters (covers these counters also). How many altogether?

Child: (raises fingers one at a time as he counts) 1, 2, 3, 4 (raises three more fingers one at a time) 5, 6, 7 — seven.

Teacher: I have seven apples and I get another two apples. How many apples do I have altogether?
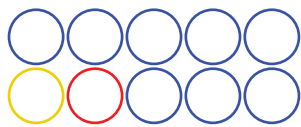
Child: (Raises fingers one at a time and whispers each count) 1, 2, 3, 4, 5, 6, 7. How many more apples?

Teacher: Two more.

Child: (Counts seven raised fingers again) 1, 2, 3, 4, 5, 6, 7, (pause as he raises two more fingers) 8, 9 — nine.

A teacher brings the video to you and asks for your opinion concerning (a) the child's numerical development, and (b) what to teach the child. What would you suggest?

Thank you for taking the time to complete this survey. Please seal this survey in an unmarked envelope and return it to your school office or other designated CMIT survey collection point.

Appendix C

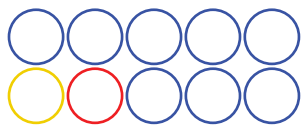### Interview Schedule CMIT Evaluation 2008

N.B. The following questions are a guide only

(Principals or Facilitators)

1. Demographic details of school: Number of students/teachers etc

2. Socio-economic status of school

3. How long has CMIT operated in school?

4. What grades currently implement CMIT?

5. i. Can you talk about your perception of the 'Status' of CMIT in the school - Is it:

   a. integral and seamless component of mathematics program

   b. supplemental to the normal mathematics program

   c. other

   ii. Please give examples to illustrate how you have come to this perception.

6. Is the implementation a part of the school management plan? Is funding allocated for its on-going support?

7. Are you aware of teachers using the LFIN to assess or program for instruction?

8. How confident do you believe individual teachers are in using the LFIN?

9. Do you perceive a difference in classroom mathematics teaching practices as a result of the school's implementation of CMIT? Describe.

Classroom teachers

1. How many years of teaching experience do you have?

2. What grades have you taught?

3. What grade are you teaching now?

4. How long have you taught this grade?

5. How long have you been implementing CMIT?

6. Briefly describe the induction and training you received.

7. What do you consider to be the main ideas or stages of development children progress through in their development of number?

8. On a scale 0 – 4 (0 –low, 4- high) How would you rate your *understanding* of the LFIN. Explain rating.

56

NEALS

9. On a scale 0 – 4 what extent has the LFIN increased your awareness of children's development of number knowledge and arithmetical strategies? How? How do you use this knowledge?

10. How *confident* do you feel in identifying the stage of development of individual children on the LFIN? (0-4 Not confident to Extremely Confident)

11. What mathematical content related to number is currently being studied in your classroom?

12. What do you feel are the key concepts/strategies children in your class need to learn for this topic?

13. Are there any particular materials or teaching strategies that you use to teach this topic to your class? Why do you use these materials/strategies?

14. In your experience, what aspects of this topic do children in this grade encounter the most difficulty? Why do you think this is so? What do you do to help them overcome these difficulties?

15. Do you utilise your knowledge of the LFIN to help you teach this topic/process? If yes, how does this help you teach? Do you consciously use the LFIN when planning individual lessons? Or for overall unit programming?

16. I want you to think of three children in your class – one who you consider to have quite an advanced understanding of this topic, another who you consider to be displaying quite an 'average' understanding and one that is struggling. For each child:

    a. explain what evidence/clues you have to support your perception of the child's developmental level.

    b. Describe the type of instruction this child receives or needs. What activities are suitable for this child's stage of development? Give specific examples of activ